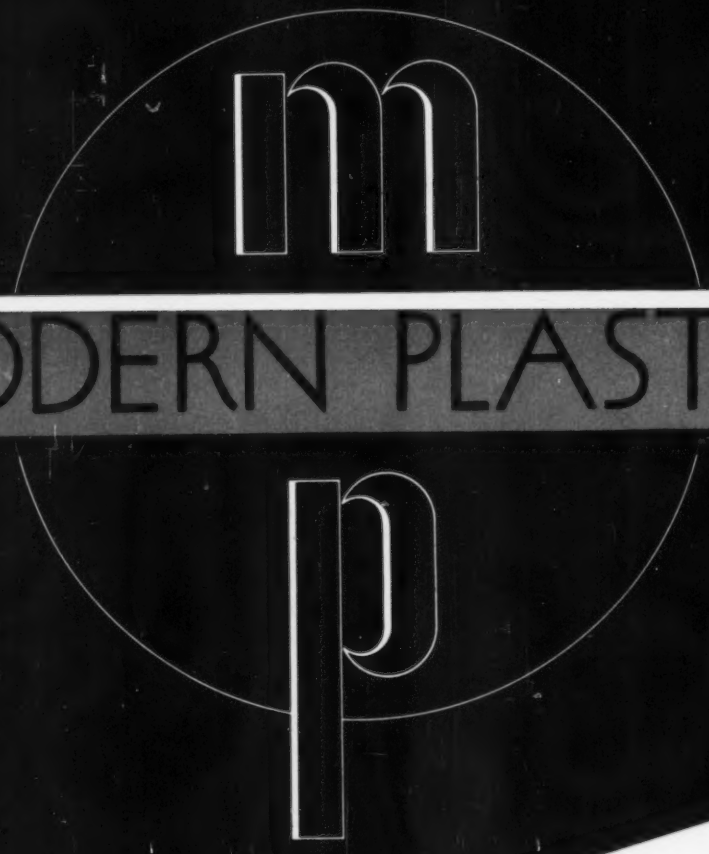
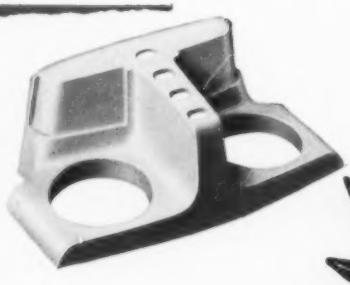
AUGUST 1953

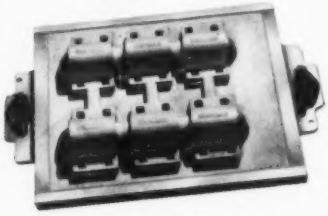


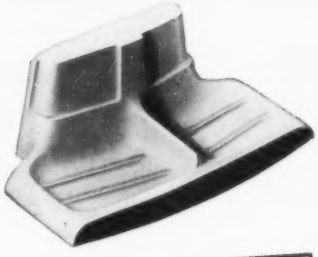
MODERN PLASTICS



CAST SHAPES

without costly procedures





Impressive short-cuts in product development or actual production are being achieved through the use of a fast-setting casting resin for . . .

- **Model or prototype work**
- **Short-run production**
- **Large-part production**
- **Masking fixtures**
- **Electroplating shields**
- **Foundry patterns**
- **Novelty castings**
- **Special electrical or corrosion-resistant parts**

This material is Durez 7421A, a liquid phenolic casting resin that hardens to full strength without pressure and with only a mild bake. It can be cast in plastics, rubber, resin, wood, or ceramics.

Parts cast by this economical method have good to excellent mechanical, electrical, and chemical properties. The resin molds readily to intricate shapes, can be machined and surface-finished easily, and can be colored before or after casting. For fast hardening with minimum shrinkage, we recommend our special accelerator.

Write for illustrated technical discussion with full instructions for use of

DUREZ 7421A CASTING RESIN

and Durez 7422 Accelerator

Address Durez Plastics & Chemicals, Inc., 1208 Walck Road, North Tonawanda, N. Y. or Rezolin Inc., 5736 West 96th St., Los Angeles 45, Calif.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
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PHENOLIC RESINS THAT FIT THE JOB

"Change Your Tire, Mister?"...."Service Your Television?"

IDEAL TOYS* molded of *Catalin Styrene* provide *carloads* of play-action!

There was a time, when to sell itself, a toy car only had to roll on four wheels! Today, its hood must not only raise and expose the motor—but also, the trunk rack must lift, and within, there must be a spare tire, roadside repair tools and a jack . . . yes,—and the windshield wipers must actually operate! Young America "demands the works"!

And if the toy is a special type truck—like the television service model pictured—it, too, must do more than roll . . . it must carry its own ladders, open wide its rear doors and, as wanted, unload antenna parts, power tube, cabinet and chassis . . . otherwise,"how's a guy goin' to do a real job?"

In low-cost, colorful CATALIN STYRENE, Ideal Toy Corp. has ingeniously molded these important bonus-play-factors into complete, single package work-units . . . so that youngsters, while playing, can also learn . . . by doing. In toys, today, it's *action* that sells, and we of CATALIN STYRENE happily share the success which these outstanding Ideal attractions are enjoying!

*Ideal Toy Corp., New York 16, N. Y.

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In addition to Styrene Molding Compounds Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

AUGUST 1953 VOL. 30, NO. 12

CONTENTS

GENERAL SECTION

PLASTICS ENGINEERING

TECHNICAL SECTION

DEPARTMENTS

Modern Plastics, published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the Act of March 3, 1879.
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Subscription $6.00 a year, $11.00 for two years, $15.00 for three years in the U.S., its possessions, South America, and Canada. All other countries $12.00 a year, $20.00 for two years, $28.00 for three years, payable in U.S. currency. Price of this issue 75 cents per copy in the U.S., its possessions, South America, and Canada; all other countries $1.25. Printed in the U.S.A. by the Hildreth Press, Inc., Bristol, Conn.
*Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Company does not make this yarn. We supply the Geon resin for the coating only.

Lighted cigarette won't burn through.

Outstanding durability—won't stretch or corrode

Tough Screen made of Armored Glass Threads

Start with fibrous glass yarn, add a manufacturer who knows what Geon vinyl materials can do, and you come up with a new super-tough yarn that's headed for sales stardom—in a new type window screen, for instance!

Glass threads are treated with a formulation of Geon resin. The result: yarn with high tensile strength and abrasion resistance. It is fire and chemical resistant. It can be heat-sealed to vinyl film for extra reinforcement. Name your color—and you can get it.

Window screens woven of this yarn are but one outstanding example, with other uses in the offing.

Geon has a way of sparking good sales ideas. For Geon materials come in a variety of forms to fit so many needs—resin, plastic granules, liquid latex. They can be used for extrusions, molding, casting, coating or dipping. They can make products resistant to heat and cold, wear, oils, greases and many chemicals. Perhaps a Geon material can help you develop or improve products—we'll help with technical advice. Just write Dept. GB-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

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about a good place to get the best in
MOLDED PLASTICS

★ **This organization specializes** in custom molding of all plastics materials.

★ **34 years experience in plastics** . . . the know-how that has resulted from serving many of the biggest names in industry and pioneering some of today's most widely used applications.

★ **Top ranking engineers and designers,** several with this organization 25 to 30 years, help you get the most from your plastics applications.

★ **For mold fabrication** and maintenance, we operate one of the largest and best equipped tool-rooms in the industry.

★ **For molding thermosetting materials,** our 4½ acre plant houses scores of automatic and semi-automatic compression and plunger molding presses including giants capable of volume production of the largest parts made.

★ **For molding thermoplastics,** a special division, housed in its own building, is equipped with dozens of the most modern injection machines with particular emphasis on units of large capacity.

★ **And, as a plus value,** you'll find here a unique faculty for understanding your needs and interpreting them promptly . . . the sound judgment that avoids costly misapplications . . . the know-how that insures a practical solution to almost any molding problem.

★ As might be expected, 60% of our business comes from firms we have served for 15 years or more.

★ A Chicago Molded engineer will be glad to discuss plans with you at any time . . . without obligation. Just write, wire or phone.

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EDITORIAL

Automatization = Speed + Quality

The big word in the heading of this editorial is one you'll be hearing and reading more and more often from now on.

Why? Because the problems connected with the development of fully automatic factories are being overcome at a furious rate.

If you'll read the lead article on "Machines That 'Think'" (p. 75), you'll realize that we are even now at a point where literally any repetitive action and any logical (non-creative) mental function can be handled better and much faster by a "machine" than by a human being or a group of human beings.

Actual case histories of mathematical calculations show that a problem which would take a person with a desk calculator seven years to accomplish is done by the electronic computer in seven minutes, and one that would take 100 years by a human being is done in two and a half hours! Furthermore, the machines constantly check themselves for accuracy; they don't make mistakes!

Different types of computers can read blueprints, magnetic tapes, punched cards, graphs, or printed equations and direct other machines to perform actions based on those readings and on calculations made from them. They can also keep check on the second group of machines and on the quality of their output.

What has all this to do with plastics? Aside from the fact that machines for automatization, being electrical or electronic, will offer a huge market for plastics parts, simply this: Probably no group of processes in all industry is more likely to lend itself to automatization than plastics processes!

Let's see how we compare with an industry that has been automatizing for several years.

One-inch plastic pipe is generally extruded at a rate of 300 ft. per hr.; carbon steel pipe, the same size, is made at the rate of 36,000 ft. per hour.

Vinyl film can be made at a rate of 450 ft. per min.; 2500 ft. of steel sheet is made per minute.

Rejects in both steel items are infinitesimal compared to rejects in the plastics products.

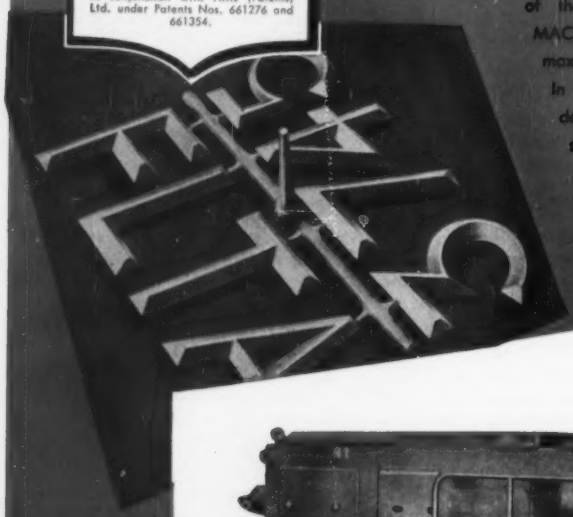
Automobile tops are stamped on a 12-sec. cycle, sides on a 10-sec. cycle, fenders on a 9-sec. cycle. Even with the finishing necessary, total time spent in making the product is much less than would be needed to make almost any product out of plastics. Automobile plants were among the first to use automatization.

It's about time we studied it too!

facts that speak for themselves

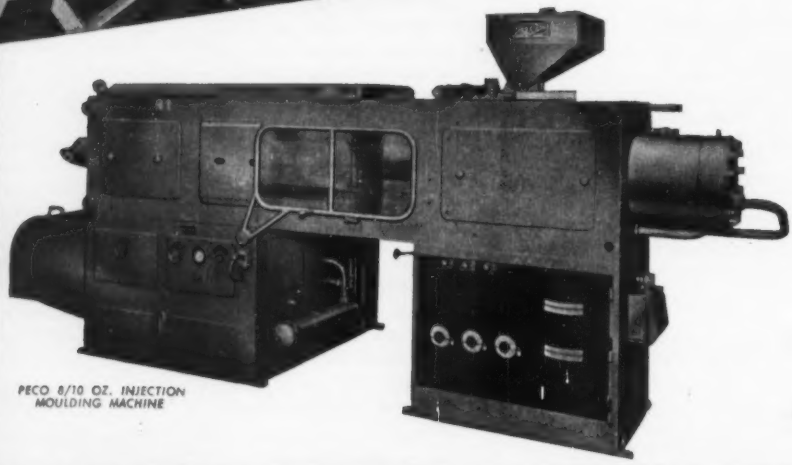
12,000
SHOTS *per* WEEK

8-impression moulding in polythene, of automobile number plate digits and letters. Mould designed and mouldings produced by the Mentmore Manufacturing Co. Ltd. in conjunction with Hills (Patents) Ltd. under Patents Nos. 661276 and 661354.



This record of weekly production can be taken as typical of the first-class performance of PECO MOULDING MACHINES. Their output can be relied on—and it is a maximum output for any type of production.

In the 8 oz. and 16 oz. machines, important new developments have been introduced, giving increased shot capacity and enabling these models to be uprated to, respectively, 8/10 oz. and 16/24 oz. machines. Further details of the full range, including smaller capacity machines, will be gladly sent on request.



PECO 8/10 OZ. INJECTION MOULDING MACHINE

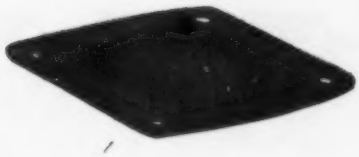
MOULDS

PECO MOULDS. Expert designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if required. An important side of the Company's work is the hobbing of cavities for moulds and medallions—the plant includes a 3,000-ton hobbing plant. Master hubs to customers' samples made as required.

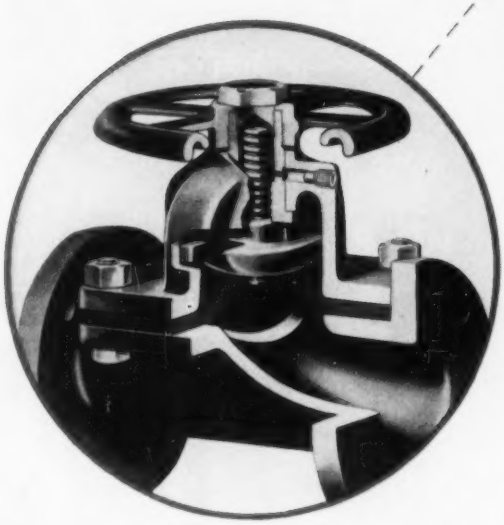
PECO PRODUCTS

THE PROJECTILE & ENGINEERING COMPANY LTD.

ACRE STREET, BATTERSEA, LONDON, S. W. 8, ENGLAND



Diaphragm of Du Pont "ALATHON" cuts down-time



Valve manufactured by
Hills-McCanna Co., Chicago

Valve part withstands flexure and chemical attack... lowers costs

In adapting its Saunders Patent diaphragm valve for handling high concentrations of corrosive chemicals, the Hills-McCanna Company required a diaphragm material that could withstand repeated flexure as well as chemical attack. Tests showed that materials which could resist the chemicals would break down mechanically after short use.

They found the answer in a diaphragm molded of Du Pont "Alathon"* polyethylene resin. Tough, resilient "Alathon" stands up under constant flexing. Mechanical failures have been virtually eliminated. "Alathon" is resistant to most chemicals, too. These diaphragms are used in valves handling such corrosive chemicals as 98% sulfuric acid heated to 125°F. at 100 psi, as well as high concentrations of other industrial chemicals. In use, they have meant lower operating and maintenance costs, less down time, increased production.

Du Pont "Alathon" has a unique combination of mechanical, chemical and electrical properties. It is used for such varied applications as chemical carboys, squeeze bottles, flexible housewares and toys, and insulation for TV lead-in wire. Its low specific gravity (0.92) and ease of molding permit mass-production economies through rapid injection molding.

Perhaps "Alathon" can help you improve or develop a product. For full information on "Alathon" and other members of the Du Pont family of plastic engineering materials, write: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 308 Du Pont Bldg., Wilmington 98, Del.

*REG. U. S. PAT. OFF.

DU PONT
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BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY
Polychemicals
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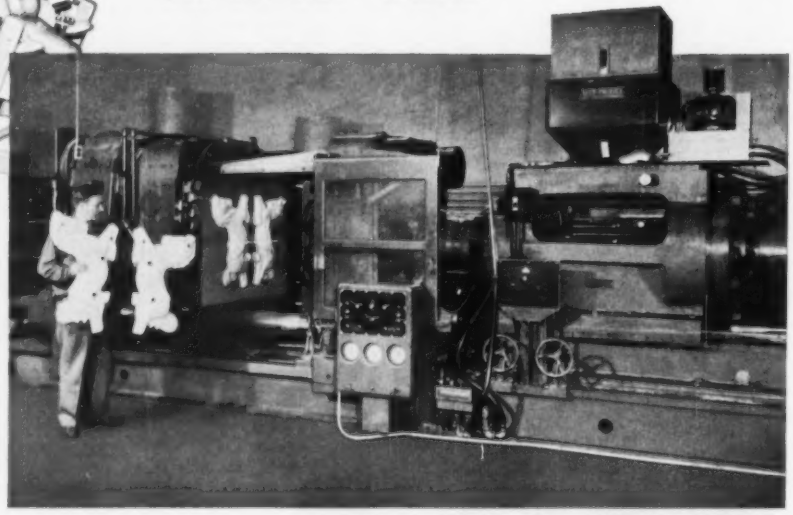
PLASTICS • CHEMICALS

MOLDING

98 oz. Wonder Horse Body on 60 oz. "REED"



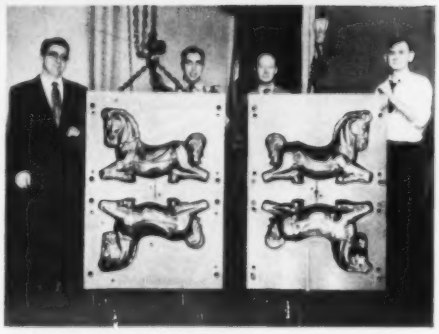
Reed-Prentice 60 oz. Injection Molding Machines apply 1500 tons clamping pressure in molding matching halves of Wonder Horse body at Ger-Ell Manufacturing Co., Chicago, Ill.

Combined efficiency of molder, manufacturer and machine are responsible for the sturdy plastic body of the new DeLuxe Wonder Horse — a product of Wonder Products Co., Collierville, Tenn.

Ger-Ell Manufacturing Co. of Chicago molds the two-part 98 oz. body of Tenite II cellulose acetate butyrate on their 60 oz. "REED". Projected area of the complete shot is 700 sq. in. Trouble-free operation enables Ger-Ell to produce approximately 500 Wonder Horse bodies per day on a 24-hour schedule.

This achievement in plastic molding is further proof that nominally-rated Reed-Prentice injection machines are the best investments molders can make for sustained profitable production.

Get full details on all "REEDS" by requesting Catalog #36.



The 60"x72" die plates of the 60 oz. "REED" readily accommodate the large 40"x55" mold which weighs over 10,000 lbs.

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

REED-PRENTICE CORP.
INJECTION MACHINES
WORCESTER MASS., U.S.A.

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3-D displays have "BOXOFFICE"

Manufactured from Celanese Acetate Sheeting by William Crook Co. Watertown, Mass.

Celanese* Acetate

EASY-TO-FORM SHEETING GIVES TRAFFIC-STOPPING REALISM TO DISPLAYS, TRADEMARKS AND PRODUCT REPLICAS

- Takes the shape you want and holds it.
- Adaptable to vacuum heat forming using inexpensive dies.
- Easy to fabricate.
- Can be blanked, stamped, stitched and riveted.
- Cemented joints have true weld strength.
- Available in colors—transparent or opaque.
- Can be spray-painted, printed and silk-screened.

Get more information about Celanese acetate sheeting—from your display manufacturer, or write: Celanese Corporation of America, Plastics Division, Dept. 101-H, 290 Ferry St., Newark 5, N. J.

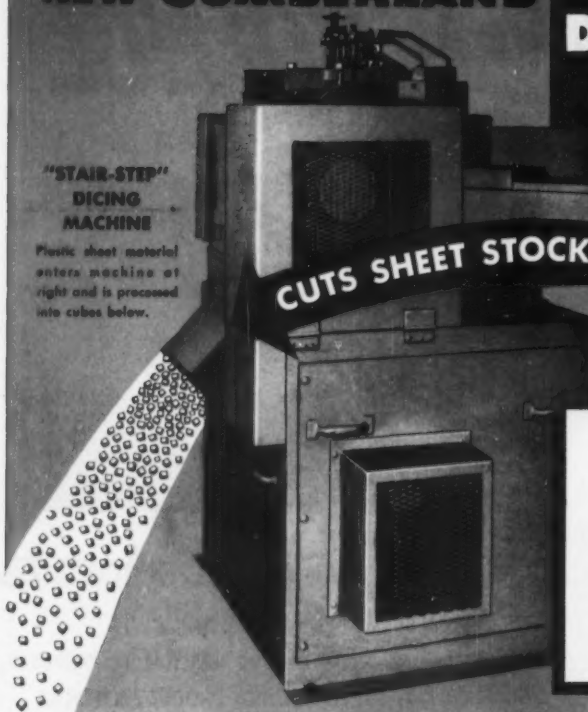
Canadian affiliate: Canadian Chemical Company, Ltd., Montreal and Toronto.

Celanese*
PLASTICS

*Reg. U. S. Pat. Off.

NEW CUMBERLAND "STAIR-STEP" DICING METHOD

Dices FULL RANGE of Plastic Materials!



"STAIR-STEP" DICING MACHINE

Plastic sheet material enters machine at right and is processed into cubes below.

CUTS SHEET STOCK INTO UNIFORM CUBES!

Now You Can Choose From TWO Cumberland Dicing Methods

NEW "STAIR-STEP" METHOD is the "universal" dicing method. It dices the *full range* of plastic materials having widely varying physical properties.

WELL-KNOWN "NOTCHED-KNIFE" METHOD dices vinyl materials of medium plasticizer content, vinylidene chloride, and other materials having suitable physical properties.

NOTCHED-KNIFE DICING MACHINE

Cumberland's "Stair-Step" dicing method offers you a *completely new* method of dicing. Perfect cubes are cut from sheet stock in one shearing action! All sides of cubes are cut cleanly. Cubes or rectangular pellets may be produced in various sizes (⅛" to ½") by simply changing knives.

WRITE FOR COMPLETE INFORMATION!

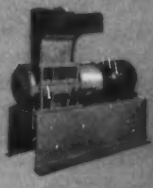
This new dicing principle makes it possible to dice the *full range* of plastic materials, including polyethylene, vinyl, acetate, and nylon. Two standard machine sizes accommodate sheets up to 7" or 14" wide. Machines to handle greater widths specially built.

CUMBERLAND MANUFACTURES A COMPLETE LINE OF PLASTICS REDUCING MACHINES

Designed Specifically for Plastics . . . . To Give You Maximum Operating Efficiency and Economy

GRANULATING MACHINES (All Models)

Eight different models, direct coupled and V-belt driven, are available to meet your requirements. For complete details, request Bulletin 251.



20" ALL-STEEL GRANULATOR

Rugged machine for granulating large "difficult-to-process" plastic parts. Eliminates prior band-sawing. 8" x 20" throat opening.

PREBREAKER

Cuts up refrigerator panels, radio, television cabinets, polyethylene bottles and containers. Available with 20" x 32" or 10" x 24" throat opening.

CUMBERLAND Engineering Company Inc.

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

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Information Round-up

on

TRADE-MARKING
IDENTIFICATION
DECORATION

Get the facts about Swift Nu-Hue and Dri-Hue. This 16-page illustrated booklet tells the whole story about these specialized color foils. Contains everything you need to know about application . . . equipment . . . operating temperatures . . . plus Swift *free* Laboratory Service. Evaluate the advantages of this Swift color branding process yourself . . .

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Get higher wet strength in your reinforced plastics!

L·O·F

Garan FINISH

gives glass fabric laminates higher wet strength than any other commercially available finish!

In actual tests with other commercially available finishes, laminates with Garanized* glass cloth showed greater wet-strength retention after a 2-hour boil.

L·O·F Garan finish on Fiber·Glass cloth imparts outstanding properties of very high flexural compressive and tensile strength and increases the translucency of reinforced plastics, whether the application is used under wet or dry conditions.

The L·O·F Garan finish, applied to glass cloth, improves and speeds the thoroughness of wetting by the laminating resin. This brings resin and glass in intimate contact, resulting in a better bond. This better bond prevents moisture from moving along the glass fibers and into the plastic.

Because laminates reinforced with Garanized glass cloth absorb less water, end products have improved resistance to weathering, are suitable for a wide range of outdoor applications. The Garan finish also gives reinforced plastics improved electrical properties, vitally important to aircraft components and other applications.

Garanizing*, an exclusive process owned by Libbey·Owens·Ford, is available to finishers through license from L·O·F. Or, if you are molding reinforced plastics and desire the names of finishers applying the Garan finish, write Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 1583 Wayne Building, Toledo 3, Ohio.

*Trade Mark

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

LAMINATES MADE WITH GARANIZED GLASS CLOTH MORE THAN MEET THE NEW, RIGID REQUIREMENTS OF MILITARY SPECIFICATIONS MIL-P 8013 (USAF)

L·O·F GLASS PLASKON FIBER·GLASS

FIBER·GLASS

Paradoxical as it may seem at first glance, each and every one of these plastic items has, at some time during its manufacture, passed through a versatile MPM extruder. Several of them came from the extruder ready to use without further processing; for others, being extruded was just the initial step. Let's get down to cases . . .

1. COVERED WIRE Using suitable cross-head dies, MPM extruders are unexcelled for covering wire with one or more thermoplastics. Famous WD-1 nylon covered assault wire is extruded on MPMs at better than 2,100 feet per minute.

2. WINDOW CHANNELING Wider use is being made every day of weather resistant, dimensionally true extruded channeling for storm window frames, frames for showcase sliding doors.

3. OUTDOOR DRAIN PIPE The outdoor drain pipe is transfer molded, but the materials from which it is made are mixed in an MPM extruder before being fed into the transfer press.

4. MULTICOLOR BEADS An unusual extrusion job done on MPM equipment are these acrylic beads; the halves of each bead can be of different colors. Two-color pierced rod is extruded and then reduced to beads on a centerless grinder.

mpm

EXTRUDERS HELP MAKE ALL THESE PRODUCTS

5. CLEAR ACETATE SHEET Enormous amounts of clear acetate sheet are produced in widths up to 48 inches and as thin as .001. Much of this extruded sheet is fabricated into transparent boxes and similar end products.

6. TOOL HANDLES Impact-resistant extruded rod is rapidly replacing wood as a material for screw driver and chisel handles. These plastic handles look better, last longer.

7. DISPLAY FORM Because they have smooth, non-snagging surfaces, these acrylic display legs are favored by hosiery dealers everywhere. The material is extruded as a tube and blown to shape while it is still hot.

8. RECORDING BELT MPM extruders have replaced less efficient machines formerly used to extrude recording belts as used with a new dictating machine. The resulting belts are low in cost, highly uniform and do not create excessive sound distortion.

9. AUTO SEAT COVERS Colorful, serviceable seat covers for automobiles, woven of extruded monofilaments, have captured the market almost completely. They are by far the best wearing, the best looking available.

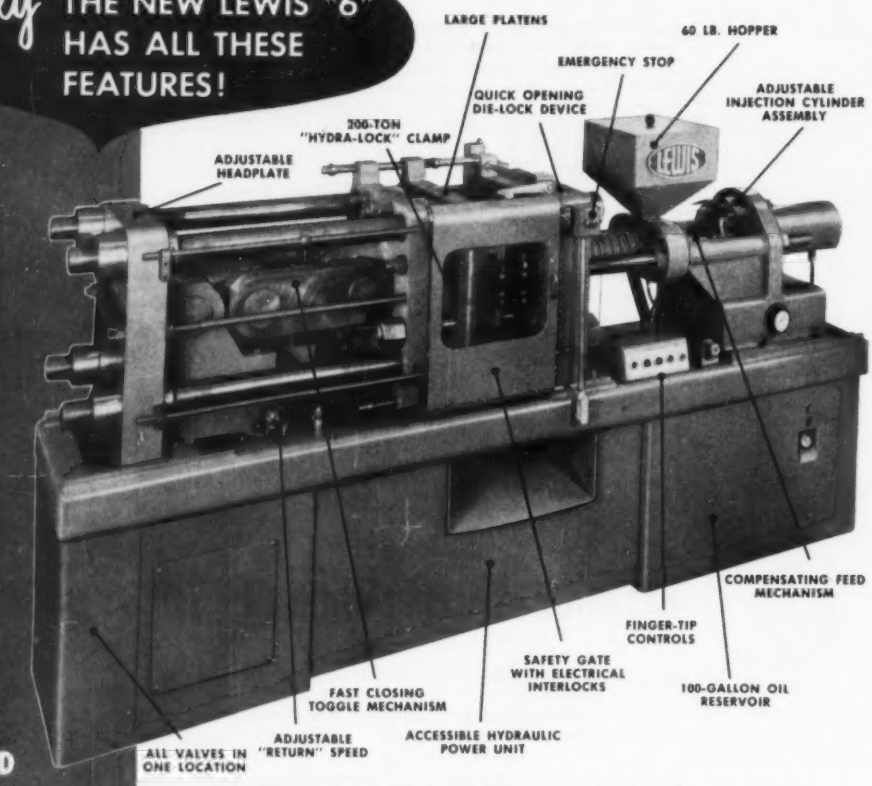
These examples demonstrate the extreme flexibility of production possible with MPM extruders. This, plus a superior heat control system and solid corrosion resistant construction for all wearing parts should make MPM extruders first on your list for consideration whenever you have *anything* to extrude.

modern plastic machinery corp. mpm

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

(West Coast Representative) 4113 W. Jefferson St., Los Angeles 16, Calif.

Only THE NEW LEWIS "6" HAS ALL THESE FEATURES!



- SPEED
- SIMPLICITY
- SAFETY
- STRENGTH

FOR LOW COST INJECTION MOLDING

The LEWIS "6" permits molding of large projected area parts formerly impossible on machines of comparable size. (Shots of 6.8 oz. of polystyrene have been molded repeatedly at rate of 2½ per minute.) Its fast automatic molding cycle, new "HYDRA-LOCK" clamping mechanism, durable construction and versatility permit this machine to do the work of considerably larger units at a fraction of their initial and normal operating costs.

Only tenths of a second and a cupful of oil are required to develop a 200-ton clamping pressure in the exclusive new LEWIS "HYDRA-LOCK". The safest, most powerful clamping device available today, "HYDRA-LOCK" also facilitates quicker, easier mold setting procedures.

All features of the LEWIS "6" are standard equipment . . . included in one remarkably low price. FOR PRECISION MOLDINGS AND MORE PROFITABLE OPERATION . . . SPECIFY THE LEWIS "6".

WRITE FOR NEW 8-PAGE BULLETIN 102 FOR COMPLETE DATA

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THE LEWIS WELDING & ENGINEERING CORPORATION

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PARAPLEX G-62
PARAPLEX G-60
MONOPLEX S-71
PLASTICIZER-STABILIZERS

For vinyl products whose low cost and permanence are selling points, the inexpensive plasticizing and stabilizing effects of PARAPLEX G-62, PARAPLEX G-60, and MONOPLEX S-71 are ideal.

PARAPLEX G-62, a newly developed plasticizer-stabilizer for vinyl resins, excels in tes for heat and sunlight resistance—no discoloration or embrittlement occurs even after 1200 hour exposure in the Fadeometer. Because of its stabilizing effect, PARAPLEX G-62 permits fast, high-temperature processing without discoloration, and savings in cost result. In addition, PARAPLEX G-62 is a permanent plasticizer of low volatility, and resists extraction by oil, gasoline, and soap and water.

PARAPLEX G-60 possesses many of the qualities of PARAPLEX G-62, and is superior in soap and water resistance. It is also more efficient and lower in cost.

MONOPLEX S-71 is a monomeric ester that combines extremely low temperature flexibility with the stabilization action of PARAPLEX G-62 and PARAPLEX G-60. Compared with other low temperature plasticizers, it is low in volatility.

To learn which PARAPLEX or MONOPLEX plasticizer-stabilizer best fits your vinyl needs, write for our plasticizer manual Dept. FF-2.

PARAPLEX and MONOPLEX are trade-marks, Reg. U. S. Pat. Off. and in principal foreign countries.

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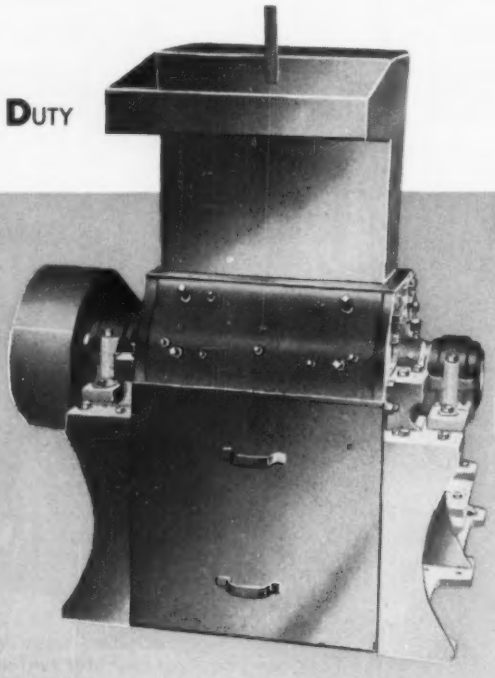
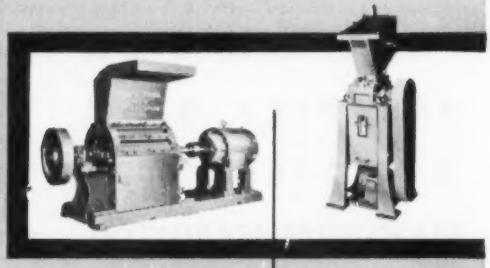
NEW B&J No. ½ HEAVY DUTY



Ball & Jewell now meets another demand of the plastics industry — powered by a 15 H.P. motor, the sturdy No. ½ H.D. will provide dependable grinding capacity to meet varying operating requirements. A breaker knife set at the top of the cheek piece (another forward step in progressive design) assures faster cutting of the toughest materials. The large 8" x 20" throat opening admits large area rejects as well as purges and other scrap, including accumulated sprues, runners, etc. Models of this new No. ½ H.D., now in use with extrusion manufacturers and injection molders, have met every performance claim.

Yes, in the B & J line there is a granulator to meet every need. Tell us your requirements and send samples of your material for grinding in our testing laboratory. Or, write for brochure.



One of our larger machines — No. 1½—Capacity up to 1200 lbs. an hour. 15, 20 or 25 H.P. motor

Our Smallest Machine — MIDGET—capacity up to 75 lbs. an hour, 1 or 1½ H.P.

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This successful company with its unique contribution to a brighter plan of living has depended on Kurz-Kasch for its moulded plastics for over a decade. We have contributed, too—sound advice on *proper* plastics applications; sensible tooling; economical production—in short, everything it takes to earn a reputation as a solid source of supply. Want to try us? For information or a proposal, just write or phone.

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INJECTION MOULDING MACHINE

Phenomenal Demand— Extends Manufacturing Programme!

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- FULLY AUTOMATIC AND FOOLPROOF
- FAST PLASTICIZING AT UNUSUALLY LOW INJECTION PRESSURE
- AUTOMATIC LUBRICATION
- 3-ZONE CYLINDER HEATING
- VICKERS DETROIT HYDRAULIC EQUIPMENT

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EARLY DELIVERY

SPECIFICATION

MACHINE CYCLES PER HOUR (Max.)	1200
APPROXIMATE WEIGHT OF MATERIAL PLASTICIZED PER HOUR (Dependent upon weight per shot and material used)	22 lb.
Area of Injection plunger	2·074 sq. in.
Pressure per square inch on material at end of plunger	9100 lb.
Total pressure on Injection plunger	18,850 lb.
Mould opens (adjustable)	6-9 in.
Maximum die space	7¼ in.
Minimum die space	3¼ in.
Maximum recommended casting area in mould	15 sq. in.
Size of die plates	16 x 10 in.

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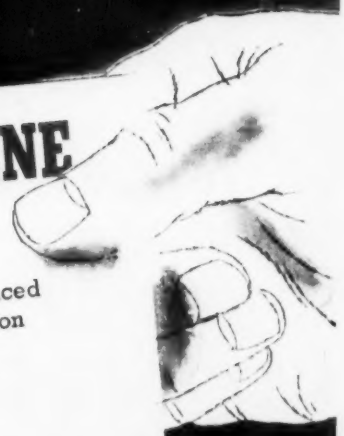

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If you sell plastic scrap . . . use reprocessed plastics or have your scrap reprocessed—look to Muehlstein for reliable service. Our complete laboratory facilities and technical staff assure satisfaction, especially with color problems.

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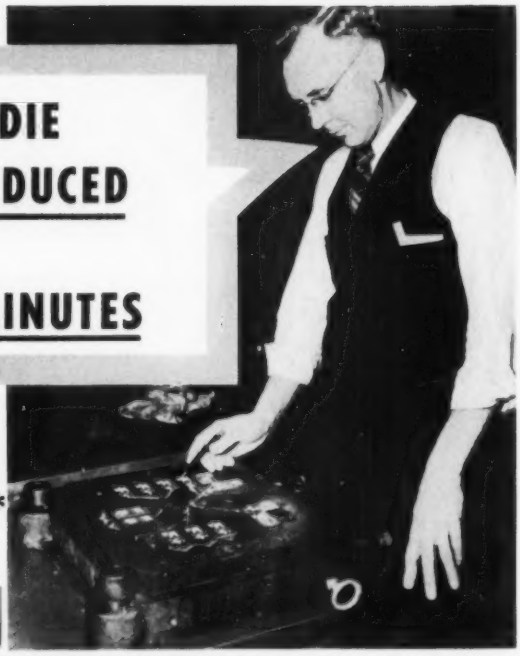
COMPLICATED DIE CLEANING TIME REDUCED FROM 20 HOURS TO 2 MINUTES



Charles Kreuziger, foreman, molding die section of Cutler-Hammer toolroom, examining a particularly intricate injection mold, which was cleaned of heat treat scale in 2 minutes instead of 20 hours.

VAPOR BLAST* Liquid Honing*

Cutler-Hammer, Inc., Milwaukee, Wisconsin, manufacturer of motor control equipment, have used Vapor Blast Liquid Honing to advantage for some time to lower production time and costs on their plastic molds and dies. They have proved many outstanding savings. One complicated die, for instance, was cleaned of heat treat scale in *only two minutes!* Normally this would have required 20 *hours* of careful hand polishing.

In addition to removing heat treat scale, Vapor Blast Liquid Honing is also used at Cutler-Hammer, Inc., to blend directional polishing and machining lines, and to bring out deeper scratches which may require additional polishing. Liquid Honing also gets into small corners almost impossible to reach by any other method. They say that the equipment "can pay for itself in a matter of weeks."

Model 3030, Type B-20, one of five standard cabinet models available to fit your needs. Custom machines also built to order.

*"VAPOR BLAST" is a trademark
*"LIQUID HONING" is a trademark

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3015H W. Atkinson Ave., Milwaukee 16, Wis.

☐ Send complete information on FREE V.B. demonstration.
☐ Send complete details on V.B. Liquid Honing.

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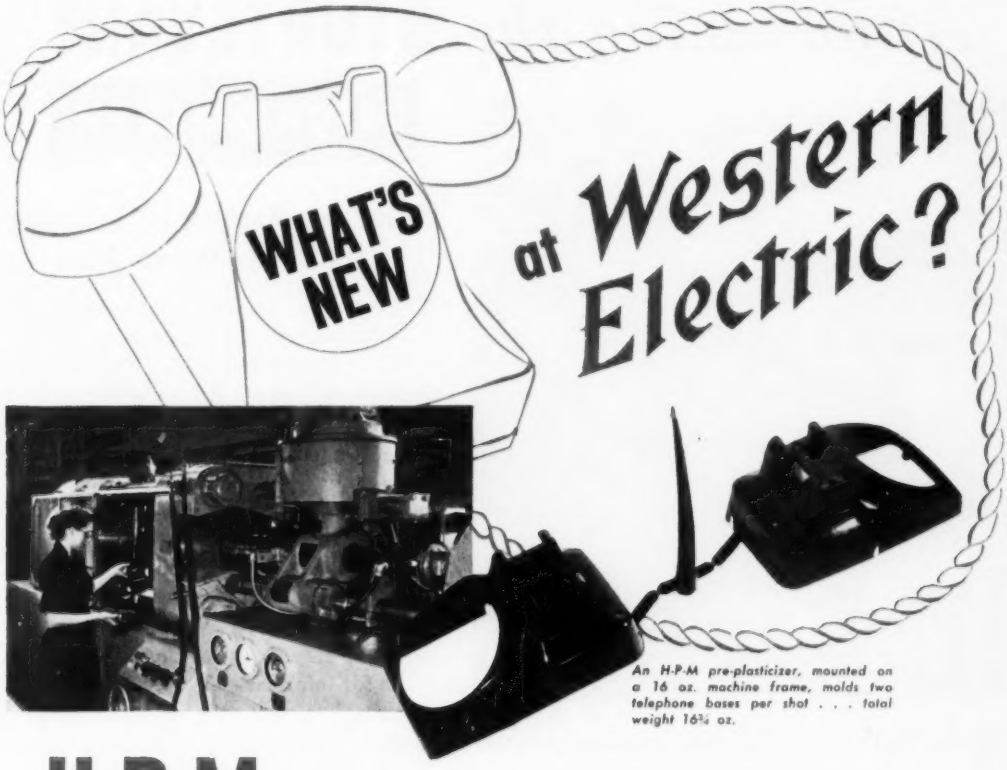
TRY IT BEFORE YOU BUY IT!



An H-P-M pre-plasticizer, mounted on a 16 oz. machine frame, molds two telephone bases per shot . . . total weight 16¾ oz.

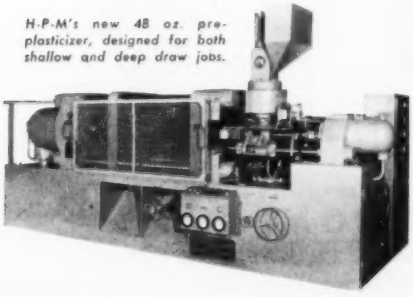
H-P-M PRE-PLASTICIZING SAVES 5 SECONDS !

5 seconds saving per cycle means a lot to any molder and it results in thousands of telephone housings in a year's time at Western Electric. Butyrate telephone bases are a natural for H-P-M pre-plasticizing which guarantees a high-speed cycle and strain-free parts. It didn't take Western Electric's engineers long to discover the advantages of H-P-M pre-plasticizing . . . a second machine is on order at this time.

Saving seconds is saving money . . . which is another good reason why many of the plastics injection molding machines at Western Electric's Indianapolis plant are H-P-Ms!

Write for full details on pre-plasticizing and H-P-M's complete line of injection molding machines—9 oz. to 400 oz. capacities.

H-P-M's new 48 oz. pre-plasticizer, designed for both shallow and deep draw jobs.



HPM

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Presses for Every Pressure Processing Application

Announcing the STURTEVANT MICRONIZER*

Pulverizing Machine for Reducing Materials to Micron Sizes

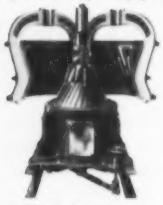
A fluid jet pulverizing machine, the Sturtevant *Micronizer* speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.

Sturtevant *Micronizer* mills are used throughout industry for reducing non-metallic and metallic minerals and ores, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes, and numerous other organic and inorganic products.

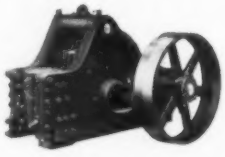
Sturtevant *Micronizer* pulverizers are available in many sizes and capacities. Write for information.

Other Sturtevant Pulverizing Equipment for Rapid Reduction of Materials...

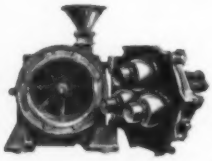
Especially Applicable for Initial Grinding of Products for the Micronizer Mill



ROTARY FINE CRUSHERS for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.

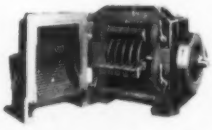


JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



RING-ROLL MILLS for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

CRUSHING ROLLS for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



SWING-SLEDGE MILLS for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

AIR SEPARATOR for separation of fines to 325 mesh and finer. Increases output from 25% to 300%... lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.

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PERFECTLY MATED! Only Phillips Drivers are perfectly mated to Phillips Screws. Look for the name Phillips on the shank.

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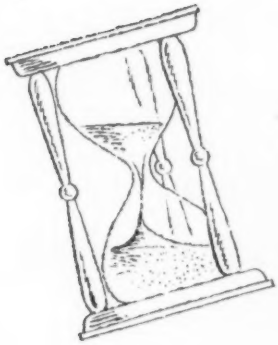

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Just mix Atlac LV in styrene whenever you're ready to use it in production. It dissolves easily, and produces a low viscosity solution that can be applied readily by spray, dip or brush.

Atlac LV will simplify your production by eliminating the need for adjusting curing cycles to compensate for aging.

Low in color, high in clarity, Atlac LV is economically priced. To get the full facts, write or call Atlas today.

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ATLAC 382—for laminating glass fiber cloth or mat, and for dry or putty type glass-filled molding compounds.

ATLAC 363—high-solubility binder, for mat and pre-form production.

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"Service" is such a pleasant sounding word that it's really a shame it takes such a kicking around from custom molders – good, bad or indifferent.

"What is 'service?' " prospective customers ask Boonton. "Is it something we get and don't pay for? Or is it something we pay for and don't get?"

"Service" is a lot of things, some small, some large. It's the helping hand we give you in styling your product. It's the imperfect pieces you *don't receive* because we inspect all your moldings carefully. It's the delivery at 8:45 a.m. Monday morning, just as we promised it. It's the suggestion you use impact material rather than regular grade for greater strength. It's the money you save by shifting from drilled holes to molded-in holes (Boonton's idea, of course). It's the product that's a little better, a little more reliable, or a little less expensive because you listened to Boonton, a molder with thirty-plus years in the plastics business.

"Service" is the most tangible intangible you'll ever come up against. At Boonton we figure it in as part of the price. You pay for it. You need it. You get it. One hundred percent.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

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and you can make it– easily and economically with PLIOVIC

HERE is top-quality vinyl flooring. Here is a highly salable product you can produce–easily and economically–consistently and profitably–with PLIOVIC, Goodyear's polyvinyl chloride resin.

PLIOVIC is so polymerized as to process easily, yet give excellent physical properties in the finished product. Its high bulk density means easier handling and full production on standard equipment. Its rapid fluxing means fast production. Its unusual heat resistance means safe color development and rerunning of scrap. Its controlled uniformity means smooth, continuous production with fewer rejects.

Get more out of your plant by putting PLIOVIC in. Get full information and technical assistance on flooring–or sheeting, film, extruded and molded goods – profitably produced with PLIOVIC, by writing to:

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plastics take to the backyard

The backyard swimming pool is now easily available to everybody's kids . . . thanks to plastics.

Bright, gay, durable colors help sell plastic pools—and thousands of other plastic objects. And that's where TITANOX titanium dioxide pigments come into the plastics picture.

For nothing can compare with titanium dioxide pigments for brightening, whitening, opacifying or beautifying plastic compounds. If you have a plastic pigmentation problem, consult our Technical Service Department.
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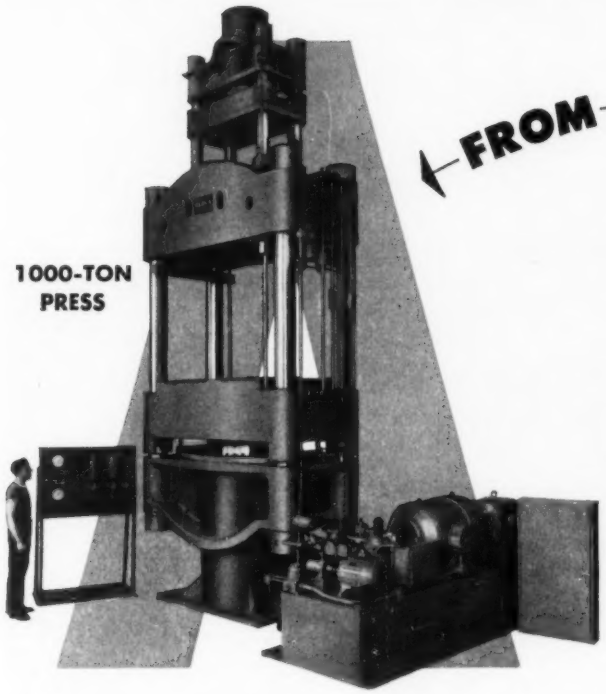
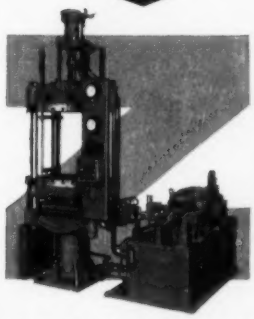
TITANOX

ELMES Covers the Compression and Transfer PLASTICS MOLDING FIELD



FROM

TO



Installation of 50-Ton Press (Lab Use) makes the 20TH ELMES MOLDING PRESS IN ONE LOCATION

The most sincere testimonial any manufacturer can receive attesting to the worth of his product is a *re-order.* Consequently Elmes was justifiably proud when the *20th* Elmes Plastics Molding Press was ordered for installation in this one location.

This story not only reflects the reliability of Elmes Press performance; it is another excellent example of how Elmes meets customer requirements *exactly.* For the new 50-ton Press as well as the 1000-Ton Press illustrated —and *many others* in the battery of 20 presses—are special adaptations of *standard* Elmes designs . . . "custom built" to meet specific job requirements.

Take the 1000-Tonner, as an example. Designed for both near and remote control, this press has two push-button control panels—one (shown in photo) situated close to the press, the other in a separate room. The flick of a switch changes this press from straight compression to transfer molding. On the compression cycle, the circuit is arranged to provide two breathe periods. Curing is set by a motor-type timer and can be furnished with any required range. Lower knockout is hydraulically operated and is *fully automatic.* And these are but a few of the many features.

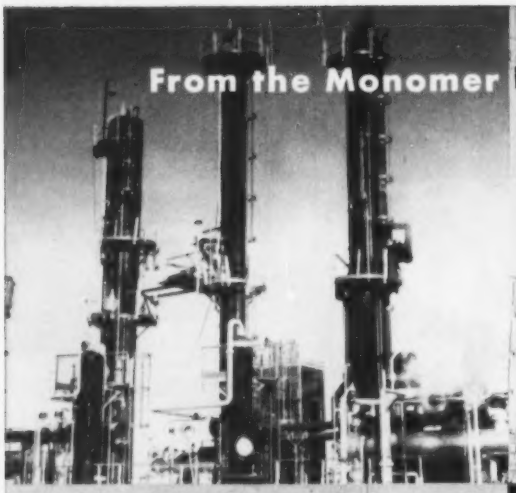
Whatever your molding requirements—for a press of entirely new design, of modified design, or of standard design—Elmes is your assurance of complete press satisfaction. Recommendations and cost estimates are yours for the asking.

American Steel Foundries

ELMES ENGINEERING DIVISION

1159 TENNESSEE AVENUE CINCINNATI 29, OHIO

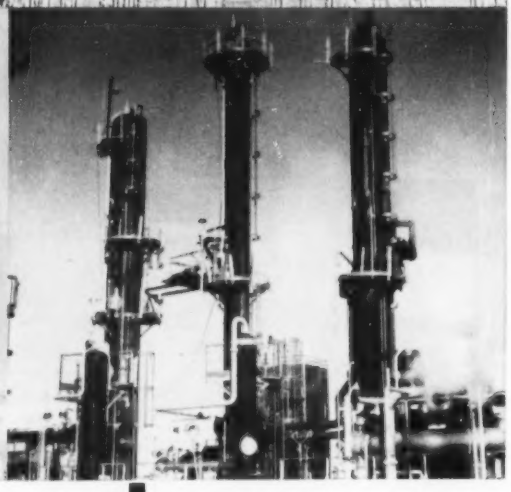
METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES



From the Monomer Headquarters of America

STYRENE
ACRYLONITRILE
VINYL CHLORIDE

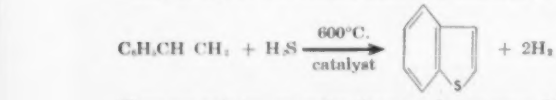
Let Monsanto's Big 3 Start You Toward New, Profitable Products



Here are two examples of how Monsanto monomers may help to raise your profits:

SURFACE FINISHING AID . . . for aluminum and magnesium castings can be made by mixing specially formulated polyesters and styrene monomer. The liquid resin will impregnate pores and slight surface mars on the castings and will set to an infusible, insoluble solid—vastly improving the appearance, the surface finish, and the use life of the final coating. Also, resin syrup can be adapted to aid the matching of a surface finish across metal and reinforced plastic parts. Write for specific formulation.

NEW RAW MATERIAL FOR COMPLEX SYNTHESES . . . *Benzothiophene* can be produced in 60% yield by reacting styrene monomer with hydrogen sulfide at 600°C. over ferrous sulfide-alumina catalyst.



These are only two examples, there are dozens more. Monomers from Monsanto can bring profits to your chemical or resin manufacturing operation with new improved copolymer resins for extruding, molding, casting, coating or adhesives. They also can help you open new paths to organic syntheses. Other advantages include:

★ **TOP QUALITY** . . . all monomers are *fresh* products produced in industry's most modern plants, under strict quality control.

★ **"TIMED SHIPMENTS"** . . . deliveries synchronized with your production. This system can release valuable tank storage space for other use.

★ **TECHNICAL SERVICE** . . . on storing, handling and inhibiting.

For more information on these products, write MONSANTO CHEMICAL COMPANY, Texas Division, Texas City, Texas.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

WHY THE PLASTEX CO.

Over three million pounds of plastic are extruded annually in intricate cross-sections alone at Plastex. Here, Orr S. Zimmerman, President (left), and P. M. Rhulman, Vice President in charge of Sales, examine a section for a sign face. In addition to custom extrusions, large quantities of plastic pipe are also produced in one of the Plastex Company's two plants in Columbus, Ohio.

WILL EQUIP THEIR NEW PLANT WITH NRM EXTRUDERS

"We have our order in for a *seventh* NRM Plastics Extruder," stated Robert O. Zimmerman, Vice President in charge of Production at the Plastex Company, Columbus, Ohio, "because all six of our present NRM's — including the 2½" model with which the Plastex Company was founded — have produced *quality* extrusions on a year in, year out, "round-the-clock" basis without breakdown or excessive maintenance. That's also why our *new* plant will be *completely* NRM equipped when it is finished in 1954."

Like the Plastex Company, NRM owners the world over *know* they can rely on NRM extruders for continuous production on a long-time basis. And, like Plastex, many of them "have their order in" for additional NRM Extruders to meet growing production demands, and to equip new plants.

If *you* are planning to purchase plastic extruding equipment, it will pay you to look into the NRM Line NOW. NRM built the first extruder specially designed for thermoplastics, and from NRM's *Creative Engineering* have come many *other* firsts, like the electrically heated extruder . . . the "torpedo type" feed screw . . . balanced heat control . . . the quick opening die gate . . . A postcard brings you complete details and data, promptly, without obligation.

2144

NATIONAL RUBBER MACHINERY COMPANY

NRM Our 25th ANNIVERSARY 1928-1953

Creative Engineering

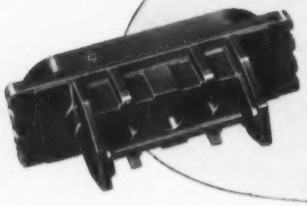
General Offices & Engineering Laboratories: Akron 8, Ohio
East: 384 Getty Ave., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Cal.
Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

Precision

This is a donor cannula . . . a connector used in blood transfusion equipment. Precision was required because the diameter of the opening at the tip controls volume of flow through the cannula. It was transfer molded of general purpose phenolic in a 40 cavity mold.

Uniformity

This contact block for a timer switch was transfer molded of impact phenolic. Each cavity in this die required over 15 critical dimensions that were held to close tolerances. The result was absolute uniformity . . . satisfactory operation of the timer switches was assured.



Sales Appeal

The sales appeal built into these radio cabinets is typical of the results you can get for your products when you choose a supplier equipped with complete injection, transfer and compression molding equipment in a wide range of machine capacities.

What Are YOUR Plastics Requirements?

Whatever they are, Mallory Plastics engineers will help you select the right materials for the job . . . engineer and build precision molds to meet your most exacting requirements. From start to finish, Mallory Plastics' complete service can handle your job economically . . . with delivery to match your production schedules. Write or call us today. Our engineers will be glad to discuss your requirements.

P. R. MALLORY PLASTICS, INC.

3670 MILWAUKEE AVE. • CHICAGO 41, ILLINOIS

A subsidiary of P. R. MALLORY & CO. Inc. MALLORY

NEWS

FOR SUB-ASSEMBLY MANUFACTURERS

New potting material provides air-tight seal and great mechanical strength for circuits containing delicate components

EPON® RESIN

gives you 5 basic advantages

1. Outstanding adhesion . . . provides a moisture-proof, vibration-proof, metal-to-metal or metal-to-glass bond. Epon resin keeps its remarkable adhesion even during a solder bath . . . ideal for potting and embedding miniature components.

2. High resistance to mechanical and thermal shock . . . permits rapid cycling between −90°F and +400°F without cracking or deforming. Even *delicate* tube assemblies can take rough usage and high operating temperatures without damage.

3. High dielectric strength... even under extreme conditions of temperature and humidity.

4. Exceptional dimensional stability . . . Epon resins set quickly with unusually low shrinkage and maintain this dimensional stability over wide temperature variations.

5. Easy to use . . . Epon resins can be cast at relatively low temperatures. Complete cures can be obtained at 150°F in less than 2 hours.

Write for information on the use of Epon resins in electrical and electronic applications.

SHELL CHEMICAL CORPORATION

CHEMICAL PARTNER OF INDUSTRY AND AGRICULTURE

EASTERN DIVISION: 500 Fifth Avenue, New York 36 • WESTERN DIVISION: 100 Bush Street, San Francisco 6

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • St. Louis

You saw this ad in Tool Engineer, Machinery, Modern Machine Shop, American Machinist, Iron Age.

...and CRUCIBLE MOLD STEEL is TOOL STEEL

You profit because mold steels are tool steels at Crucible. Our reputation as specialty steel leaders was built with tool steels.

That means you get all the experience of more than half a century of tool steel leadership when you buy mold steel from Crucible.

Crucible mold steel *is* better—because it's tool steel. And you'll find mold steel stock in strategically located warehouses from coast-to-coast.

WRITE TODAY FOR YOUR TOOL STEEL SELECTOR

Get your copy of the unique Crucible Tool Steel Selector — a quick twist of the dial gives you the right tool steel for the right job. And the selector picks mold steel, tool 9-inch diameter; printed in 3-colors.

CRUCIBLE first name in special purpose steels

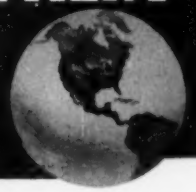
53 years of Fine steelmaking

MOLD STEEL

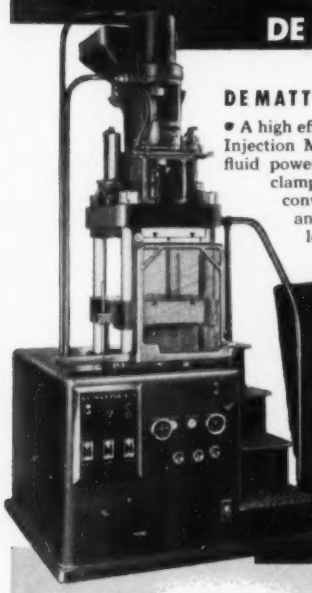
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N.Y.

DE MATTIA MOLDING EQUIPMENT

FOR IMPROVED PRODUCTION IN THE MODERN MOLDING PLANT — De Mattia molding presses and granulators — are world famous for fine performance and sureness of operation. Rugged De Mattia construction refinements assure long, continuous service.



DE MATTIA MOLDING PRESSES



DE MATTIA 4 OUNCE VERTICAL

• A high efficiency, all hydraulic De Mattia Injection Molding Press featuring smooth fluid power for both injection and mold clamping operations. Design permits conversion for both compression and transfer work by use of a few low cost additions.

DE MATTIA 12 OUNCE HORIZONTAL

• The De Mattia Model C-1 Injection Molding Press combines the latest design advantages with the ultimate in molding performance. Features uniform hydraulic pressure on entire die face, high mold clamping pressure and exceptionally heavy tension members.

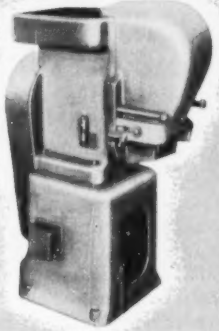
DE MATTIA BULLETINS

DE MATTIA GRANULATORS

DE MATTIA GRANULATOR No. 1

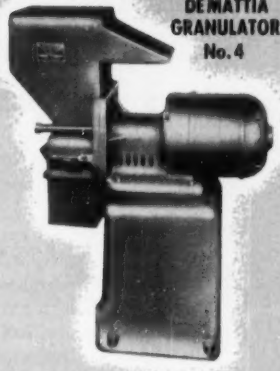
A simple, rugged and highly efficient granulator. Processes 200 lbs. per hour. Floor space required — 32" x 44"; net weight with motor — 600 lbs. approx. Features high grade roller bearings with positive seal.

DE MATTIA GRANULATOR No. 3



Salvages large chunks from heating cylinder, nozzle accumulations and tough molded pieces. Floor space — 32" x 18" x 45" high; net weight including motor 750 lbs. Heat treated alloys steel rotor.

DE MATTIA GRANULATOR No. 4



Especially recommended for installation along side the molding press. Available with or without base. Overall dimensions — 34" long, 12" wide, 23½" high (from bench). Hopper opening — 9" x 4½"; net weight 375 lbs.

New York Sales Office: 50 Church St.
Cable Address: Bromach, New York
Midwestern Representative: E. Maywald
189 West Madison St., Chicago 2, Illinois

DE MATTIA MACHINE and TOOL CO.

CLIFTON, NEW JERSEY

MOLDING PRESSES • GRANULATORS • MOLD MAKING

FASTEST THING IN FASTENINGS®

NEW Tinnerman Push-On SPEED NUTS®
. . . for wide range of applications
— PRICE SAVINGS AVERAGE 25%!

● Tinnerman, originators of Push-On type SPEED NUTS, offers this new C12000 Series at substantial savings! Large volume, high speed production, plus years of engineering and manufacturing experience make this economy possible! These new lightning-fast Push-Ons are available in a complete range of popular sizes, with rust-resistant finish, for round, D-shaped or rectangular studs. A unique feature, exclusive with Tinnerman Push-Ons, is their use over D-shaped studs where removability is desired.

Call or see your Tinnerman representative for full, cost-saving information about these new, low-priced Push-On type SPEED NUT brand fasteners.

NEW C12000 Push-On
SPEED NUTS
. . . are one-piece, self-locking, spring steel fasteners. Start by hand . . . zip down over integral studs, rivets, tubing, nails, any unthreaded parts; bite lock on smoothest, hardest surface!

Send today for copy of "Greater Savings Than Ever with C12000's"; also FREE Production Samples! Write: TINNERMAN PRODUCTS, INC., Dept. 12, Box 6688, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A.—7 rue Henri Barbusse, Levallois (Seine).

PACKAGE EASILY AND ECONOMICALLY FORMED

PACKAGE DISPLAYS BETTER, SELLS PRODUCTS FASTER

ELECTRONIC
U.S. Royal
4

PACKAGE SEALS AGAINST DAMAGE AND DISCOLORATION

designed to sell with

HERCOCEL®

by GAIR and US

*A trademark of U. S. Rubber Company.

A protective plastic covering for golf balls called Plasti-Guard* is the latest thing in sporting goods packaging. A tough, transparent display as well as a package, it attracts sales and keeps contents sealed, electronically, against damage and dirt until used. Balls can be removed one at a time without opening the other Plasti-Guards in the set. Developed by Robert Gair Co. and United States Rubber Company, this new triple package is now being formed with Hercocel A, exclusively for U. S. Rubber. For complete information on Hercocel plastics and on the design and technical assistance offered by Hercules, write:

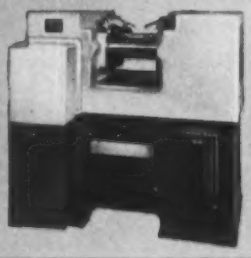
HERCULES POWDER COMPANY

Cellulose Products Department, 916 Market Street, Wilmington 99, Del.

One of these FOUR DESIGNS may be just THE LABORATORY MILL you need

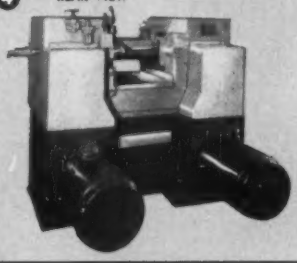
1 — FRONT VIEW

2 — REAR VIEW



3 — FRONT VIEW

4 — REAR VIEW



	Method of Speed Control	No. of Motors	HP Each Motor	Friction Ratio	Roll Speed (RPM) Front	Roll Speed (RPM) Back
1	Constant	1(AC)	7½	1.4:1	23.5	33
2	Vari-pitch Pulley	1(AC)	7½	1.4:1	13 to 24	18 to 34
3	Vari-pitch Pulleys	2(AC)	5	Variable	20 to 38	18 to 34
4	Variable Voltage	2(DC)	5	Variable	4.5 to 34	6 to 45

Here is a standard, two-roll, 6″ x 13″ laboratory mill, which you can have with four different drive arrangements. One of these should give you exactly the roll speed, or speeds, and friction ratio you need for your experimental work.

Drive may be (1) by single AC motor with mill gearing to give constant roll speed and 1.4:1 friction; (2) by single AC motor driving the rolls through vari-speed sheaves to give a back roll speed range of 18 to 34 RPM and 1.4:1 friction; (3) by two AC motors with vari-speed drives for friction ratios from even speed up to 2.1:1; (4) by two DC motors with variable voltage control for ratios from even speed up to 10:1 friction.

Standard mills have self-contained automatic cascade lubrication, swinging scraper, tilting guides and knee-operated safety trip. Optional features include chrome-plated rolls, extra hand scraper, air-operated scraper, ratchet roll adjustment, and batch-off roll.

Send for further information about this versatile mill. Or, if you prefer, a Farrel-Birmingham engineer will be glad to discuss your laboratory equipment problems with you at any time.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston
FB-824

Farrel-Birmingham®

Integral speed reducer saves costly parts . . . *TIMKEN® bearings save power*

BY using a Master Electric Company Gearmotor, the makers of this plastic forming machine saved themselves the design complication of a separate speed reducer. The motor frame, worm and worm wheel shafts are all mounted in one compact unit. One pair of gears, four Timken® tapered roller bearings and a countershaft are the moving parts that have been added to secure the speed reduction of the gearmotor.

To get the most out of the lapped and polished accuracy of the worm, both the worm shaft and worm wheel shaft are mounted on Timken bearings. Because their tapered design gives them the ability to take radial and thrust loads in any combination, they hold the shafts accurately positioned. The gears stay in proper mesh, work with the minimum friction—and last longer. A smooth flow of power is assured.

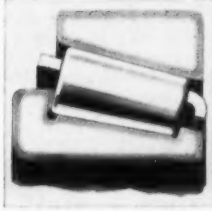
To be sure of getting all the advantages of genuine Timken bearings, specify them by name—and look for the trade-mark "Timken" stamped on each bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

MASTER ELECTRIC COMPANY gearmotor eliminates need for separate speed reducer on a plastic forming machine. Four Timken bearings prolong gear life, save power, banish maintenance headaches.

TIMKEN

TAPERED ROLLER BEARINGS



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION

FIBER PG GLASS

Helps make plastics *better... safer... lighter... stronger*

Pittsburgh Fiber Glass is made in the nation's newest fiber glass plant, using a system of controls that produces

—a high degree of fiber uniformity, enabling weavers to supply cloth that better meets the needs of laminators.

—Roving packaged with a uniform tension that improves automatic feeding in preform operations and also assures best results when used for such products as bar stock and fishing rods.

Roving packaged for all needs

In addition to 140's fiber in standard 35-pound, 60-ends packages, Pittsburgh Roving is also supplied in 12-ends and 24-ends, or on special order in any number of ends up to 60. Standard packaging provides for drawing the Roving from the inside; it can also be obtained on spools which draw from the outside.

We will welcome the opportunity of furnishing you with complete information, including the names of weavers using Pittsburgh Fiber Glass yarns. Pittsburgh Plate Glass Company, Fiber Glass Division, 420 Fort Duquesne Boulevard, Pittsburgh 22, Pa. District Sales Offices: Chicago, Cincinnati, Cleveland, Detroit, New York, Washington.

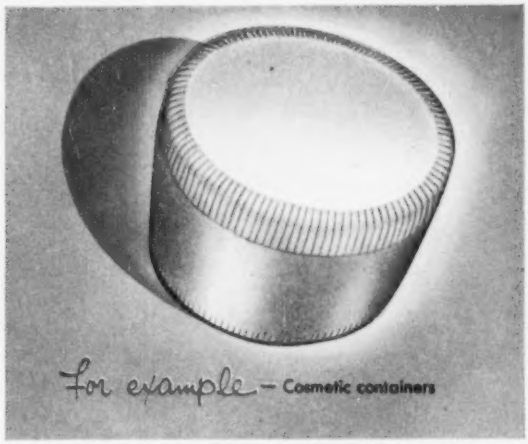
FIBER PG GLASS PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

For precision and versatility—choose

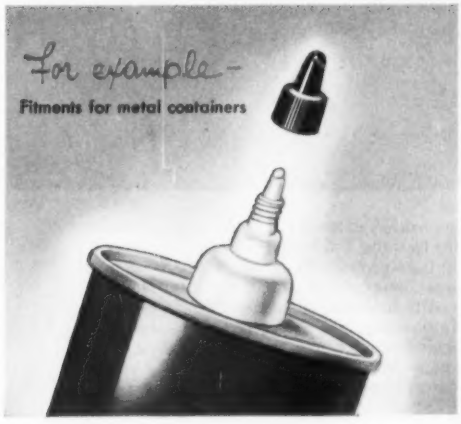
OWENS-ILLINOIS for PLASTICS

For example—
Fitments for glass containers—(metal or plastic closure and glass container all by Owens-Illinois)



For example—Cosmetic containers

For example—
Fitments for metal containers



For example—Tablet containers

Owens-Illinois packaging know-how and high-quality standards offer you the *finest* in molding plastic facilities . . . Injection molding . . . Compression molding . . . A complete range in plastics for packaging, for specialties.

Plastics Division—Owens-Illinois

OWENS-ILLINOIS GLASS COMPANY, TOLEDO 1, OHIO *Branch offices:*

Albany . . . New York	Detroit . . . Michigan	Oklahoma City . . . Oklahoma
Atlanta . . . Georgia	Fresno . . . California	Omaha . . . Nebraska
Baltimore . . . Maryland	Houston . . . Texas	Peoria . . . Illinois
Birmingham . . . Alabama	Indianapolis . . . Indiana	Philadelphia . . . Pennsylvania
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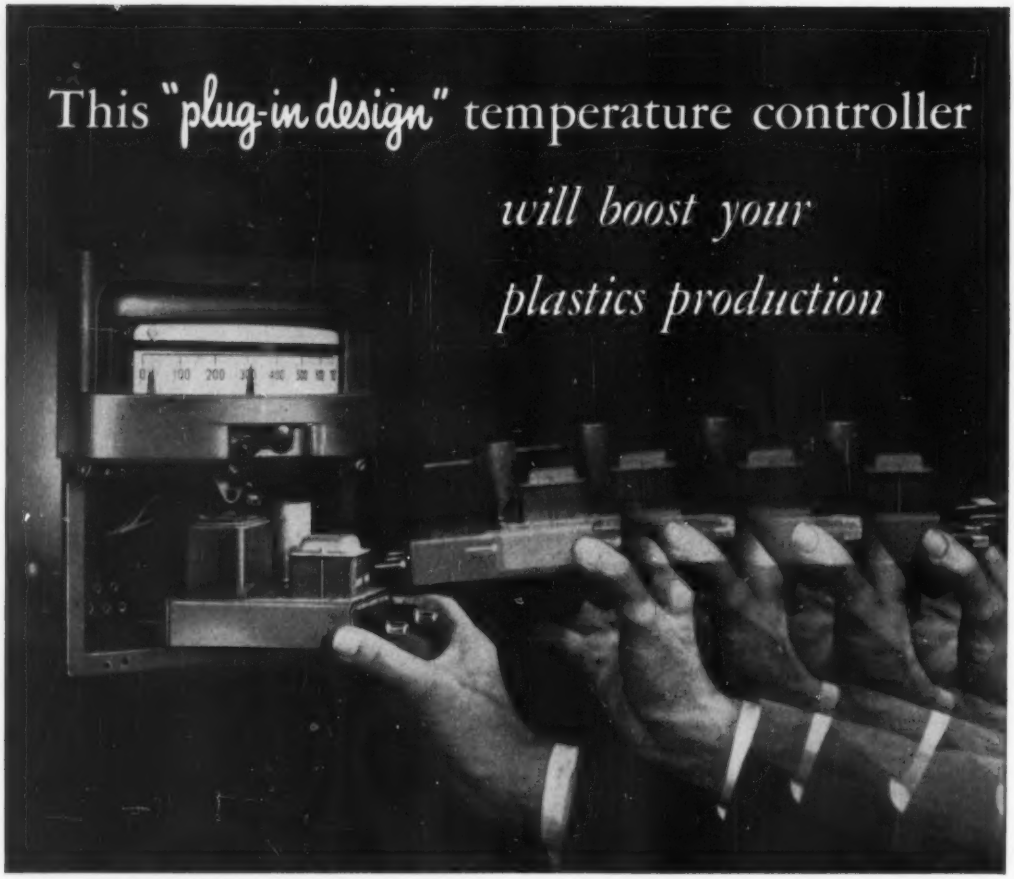
Buffalo . . . New York	Kansas City . . . Missouri	Portland . . . Oregon
Charleston . . . West Virginia	Los Angeles . . . California	Richmond . . . Virginia
Charlotte . . . North Carolina	Louisville . . . Kentucky	Rochester . . . New York
Chicago . . . Illinois	Memphis . . . Tennessee	St. Louis . . . Missouri
Cincinnati . . . Ohio	Milwaukee . . . Wisconsin	St. Paul . . . Minnesota
Cleveland . . . Ohio	Nashville . . . Tennessee	Salt Lake City . . . Utah
Columbus . . . Ohio	New Orleans . . . Louisiana	San Francisco . . . California
Dallas . . . Texas	New York . . . New York	Seattle . . . Washington
Denver . . . Colorado	Oakland . . . California	Toledo . . . Ohio

This "plug-in design" temperature controller *will boost your plastics production*



THE PICTURE above shows how easy it is to interchange a complete control unit of the *Pyr-O-Vane* temperature controller. It takes only *seconds*—and your extruder or molding press never gets tied up for instrument service.

Simplified maintenance is only one of the many benefits that you get from the *Pyr-O-Vane* controller. Equally important is its ability to hold critical temperatures with the hair-splitting precision that pays you big dividends . . . in faster cycle times, fewer rejects, accurately dimensioned moldings, better uniformity of color and finish.

Ideal for all types of extruders, injection machines, press platens, molds, and dies—the *Pyr-O-Vane* controller is available as a contact type instrument for on-off, two-position or three-position control . . . or as a proportional controller—the Pulse *Pyr-O-Vane*—which provides time-proportioning action. The control units are complete, plug-in components that can be readily interchanged depending on the type of control required for a specific application. The galvanometer unit, with its indicating scale, also plugs in; range changing becomes a simple matter of inserting a different unit.

Your local Honeywell engineering representative will be glad to discuss how these versatile controllers can go to work in your plant. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4437 Wayne Ave., Philadelphia 44, Pa. Service centers in more than 90 principal cities.

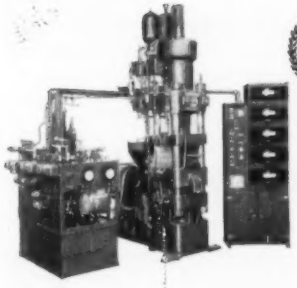
● **REFERENCE DATA:** Write for Catalog 1053 on "Pyr-O-Vane Controllers."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

WHAT DO THEY HAVE IN COMMON?

17.2 oz. 23 oz.

They've been molded of rigid unplasticized polyvinyl chloride on a Jackson & Church pre-plasticizing press



In less time than it takes to tell it, new J-C pre-plasticizing presses can turn out molded pocket combs, or contour-formed shoe trees, or corrosion-resistant threaded couplings!

The unusual part of this accomplishment is that J-C presses are able to injection mold rigid unplasticized polyvinyl chloride, as well as any other thermoplastic material.

New J-C presses featuring the Hendry pre-plasticizing system, are outstanding for their ability to produce parts that are completely uniform and strain-free.

J-C pre-plasticizing presses are available in capacities of 6, 16, 48, 72 and 200 ounces.

Hendry PRE-PLASTICIZING PROCESS J-C JACKSON & CHURCH CO. Saginaw Michigan

JACKSON & CHURCH CO. SAGINAW, MICHIGAN

Work well done since eighty-one

ANOTHER NEW DILTS PRODUCT

HIGH SPEED

POLYETHYLENE EXTRUSION-LAMINATOR

Complete Polyethylene Extruder-Laminator installations available through Dilts.

Model PL-1000 (shown) . . continuous operation to 1000 F. P. M.

Model PL-400 . . . . . continuous operation to 400 F. P. M.

Model PLL . . . . . Laboratory or Pilot Plant operation.

THE BLACK-CLAWSON COMPANY
DILTS MACHINE WORKS DIVISION
Fulton, New York

Dilts

Embossers
Coaters
Laminators
Continuous Unwinds
Continuous Winders

CONTINUOUS POLYETHYLENE LAMINATOR

Electric Range Parts

Ranges don't have to be beautiful in order to be efficient—but they do have to be beautiful in order to attract buyers in a highly competitive market. Plastics lend themselves admirably to the achievement of decorative utility, and ERIE, pioneer in custom molded plastics, is a natural choice of many leading manufacturers as a source of dependable supply.

ERIE plastics are used for control panels and for translucent knobs which reveal at a glance which switches are on. They are used for name plates and trademarks in three-dimensional plastics to give proud identification with jewel-bright beauty that enhances the value of the product.

Write for your copy of bulletin,
"Who We Are . . . What We Do in Plastics"

25th Anniversary ERIE RESISTOR CORP.

ERIE RESISTOR CORPORATION . . . PLASTICS DIVISION

Main Offices: **ERIE, PA.**

Sales Offices Cliffside, N. J. • Philadelphia, Pa. • Buffalo, N. Y. • Chicago, Ill. Detroit, Mich. • Cincinnati, Ohio • Los Angeles, Calif.

Factories **ERIE, PA. • LONDON, ENGLAND • TORONTO, CANADA**

Another new development using

B. F. Goodrich Chemical *raw materials*

Motor starter unit made by The Clark Controller Company, Cleveland, Ohio. Hycar rubber-phenolic compound supplied by Durez Plastics & Chemicals, Inc., North Tonawanda, New York. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

Add Hycar...Subtract Breakage!

IN testing experimental models of the heavy-duty, 4-pole magnetic motor starter pictured, breakage sometimes occurred with the contact arms.

This was a job where Hycar American rubber could help, as it has on so many similar problems. Hycar was added to the phenolic resin molding compound. It provided the required impact strength and shock resistance. The experimental contact arms worked perfectly—breakage was eliminated. Full-scale production was started.

But Hycar does even more. It also provides high dielectric strength; the molding compound is electrically safe.

Hycar-phenolic compounds are noted for their exceptional shock-resistance—2 to 5 times that of conventional phenolic compounds. They simplify operations, too. In processing, they provide good molding characteristics . . . easy flow in the mold . . . resistance to cracking around metal inserts in the part.

Hycar is highly versatile. It is used as a modifier for phenolic resins . . . as a base material . . . as an adhesive base . . . as a latex for coating or impregnating. Perhaps one of the many Hycar compounds can help you improve or develop more saleable products. We'll help with technical advice. For information, please write Dept. HV-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

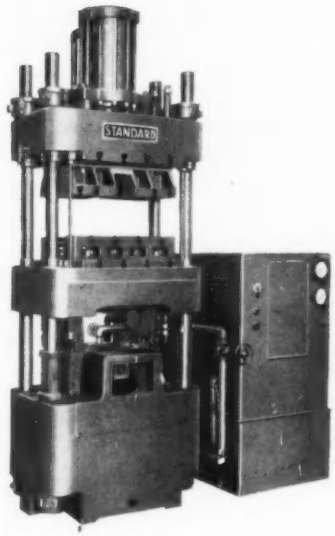
B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

STANDARD
MOLDING PRESSES

offer Six-way savings to make Molding PAY OFF



Do you want to see expanding profits pouring out of your molding presses? Standard does, too; constructs molding presses which give you savings in six ways:

SAVE MONEY—installation is inexpensive—cost of maintenance is lower—there is little or no time out for servicing.

SAVE LABOR—Sequence-type automatic cycle control, with controlled speeds, and accurate adjustment of "breathing", increases output per man hour, permits one operator to run several presses.

SAVE TIME—Fast opening and closing action, automatic change-over from low to high pressure, properly timed and without attention, plus the Sequence-type automatic cycle control, all save precious seconds.

SAVE MATERIAL—automatically controlled speed saves material because it cuts down tendency toward "surge" from old cavities.

SAVE POWER—perfected toggle action, plus low hydraulic pressures, reduce needed power input.

SAVE SPACE—compact, self-contained presses are complete units in themselves—require less floor space.

It's this kind of careful planning and construction that makes Standard—super-*standard in the manufacture of compression and transfer molding presses.*

DS

DAVIS-STANDARD SALES CORPORATION

16 Water Street, Mystic, Connecticut

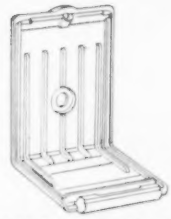
Sole Selling Agents for

THE STANDARD MACHINERY COMPANY

Extruding Machines and Molding Presses

Here's how MMM molds "MULTIPLASTICS PARTS" for One-Source-Service in Production Manufacturing

Camera reproduced by courtesy of Herold Manufacturing Company

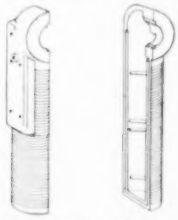


MMMolded Phenolic Back & Bottom

MMMolded Polystyrene Cover and Acrylic Viewing Lens

MMMolded High Impact Polystyrene Film Cage

MMMolded Acrylic Sighting Lens and Butyrate Lens Mount



MMMolded Phenolic Flash Gun Housing

MMMolded Butyrate Taking Lens Mount

MMMolded Phenolic Sides

11 MMM Customolded Camera Components...

MMM molders and mold makers are long on experience in producing custom parts to meet the requirements of fast precise production line assembling. And continuous research with new materials and new techniques qualifies MMMolders to produce the part to fit the function. From the plastic lenses to the plastic housing this 11 piece production is an example of how it's done. Let us do it for you. What's your production problem?

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Midwest Molding AND Manufacturing COMPANY
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We are interested in: Custom Plastics ☐ Electronic Parts ☐ Molded Motor Parts ☐

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Send this coupon attached to letterhead

From Sleek Boat Hulls To Tubs For Automatic Washers

Pittsburgh Selectron POLYESTER RESINS

Now Ready For A Thousand New Uses

THE growing acceptance of Pittsburgh SELECTRON Resins for civilian and military production is not surprising. These remarkable reinforcing polyesters have enhanced appearance, improved utility and reduced manufacturing costs on a wide range of products from boat hulls to tubs for automatic washers.

● **The Winner Manufacturing Company,** of Trenton, N. J., uses SELECTRON in molding entire boat hulls. There are no seams or joints to open under vibration, shock or weather, or to require seasonal conditioning. The Apex Electrical Manufacturing Company, of Cleveland, Ohio, uses these resins to build two-piece baskets for its Wash-A-Matic that are lighter in weight, give better service and cost less than earlier 32-piece metal assemblies.

● **SELECTRON Resins** are thermo-setting polyesters which are available in consistency from a thin syrup to extremely high viscosity. They polymerize to form solids, with or without heat and with or without pressure.

● **When combined** with such fillers as Fiberglass, cotton, rayon, nylon, felt, sisal, paper, etc., SELECTRON Resins provide a new kind of material that is lighter than aluminum, yet—weight for weight—is stronger than steel. This material has great impact resistance and withstands the deteriorating influence of weather, sunlight, heat, abrasion and many chemicals. It can be molded in durable colors.

● **Parts in which** SELECTRON Resins are used can be molded either by hand lay-up, direct molding, continuous lamination or pre-forming. These resins can also be used without fillers for casting, potting and impregnating.

● **More and more** manufacturers are turning to SELECTRON Resins to make their products better looking, stronger and more durable. Why not call on us for advisory service? We'll be glad to have one of our engineers discuss your problems with you without cost or obligation. Such a visit may point the way to important production economies and added sales appeal.

Send for FREE Booklet

Write, wire or phone today for our new booklet containing description of SELECTRON Polyester Resins and explaining many of the ways in which they can be used. Pittsburgh Plate Glass Company, SELECTRON Products Division, 2000 Grant Building, Pittsburgh 19, Pa.

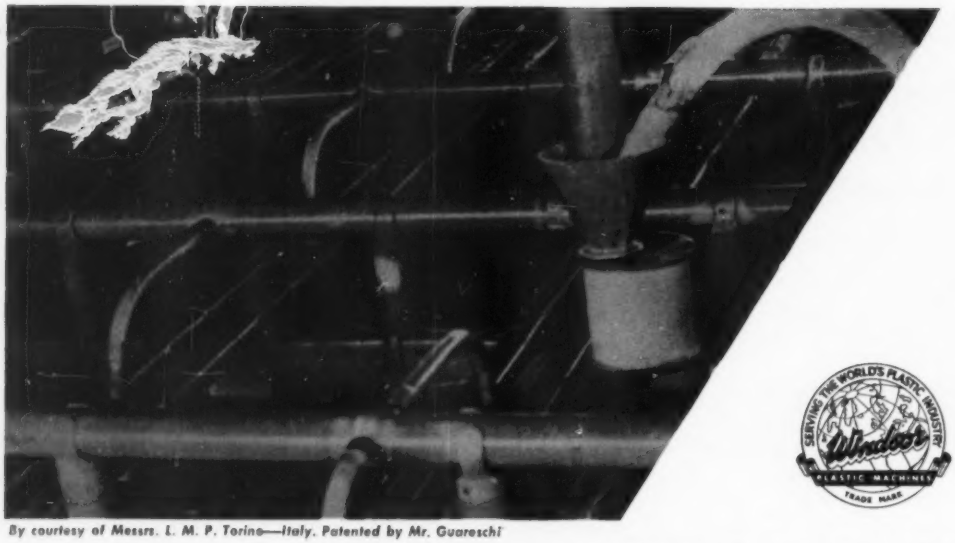
Just a few products in which Pittsburgh SELECTRON Resins are now used—

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron PPG

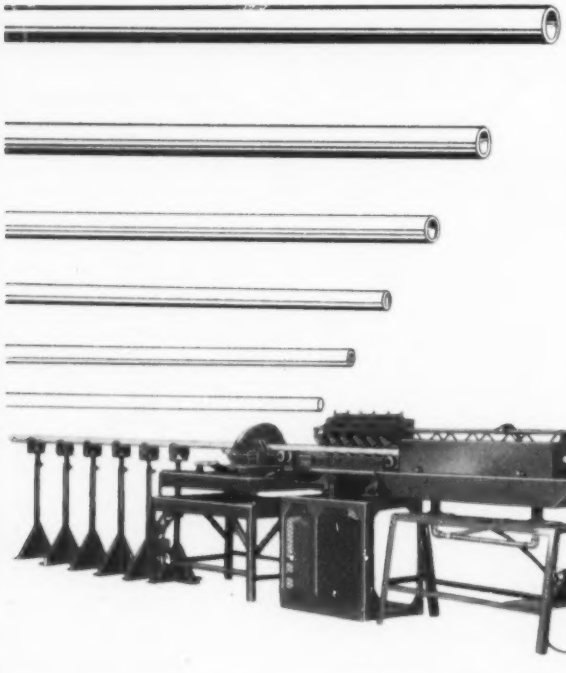
PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY



By courtesy of Messrs. L. M. P. Torino—Italy. Patented by Mr. Guareschi

P.V.C. PIPE EXTRUSION UNIT



Rigid pipe, because of growing demand, has inspired a substantial number of installations of *WINDSOR* extruders.

This unit produces pipe up to 4″ diameter and in any required length.

Write for full information.

R.H. WINDSOR LTD

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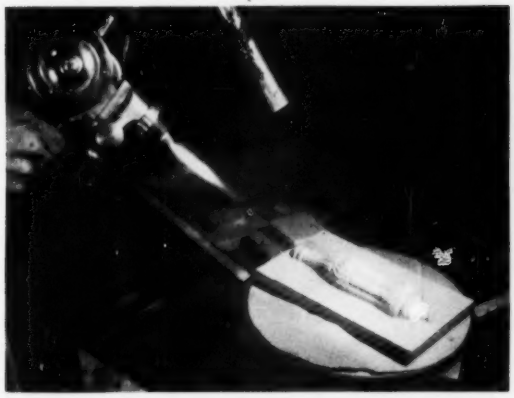
EXCLUSIVE U.S.A. REPRESENTATIVE: F. J. Stokes Machine Company, Philadelphia 20, Pennsylvania.
EXCLUSIVE CANADIAN REPRESENTATIVE: Wilmod Company, Plastics Division, 2488 Dufferin St., Toronto.

molds made in minutes

by fast, low-cost metallizing process

For low-pressure, vacuum, slush and lay-up molding.

Metallizing, the spraying of molten metal, is now being used for the production of molds for low-pressure, vacuum, slush and lay-up processes, in a wide range of mold sizes—some lay-up types as much as 30 feet long. These metal molds are made quickly, at low cost; masters may be of metal, cloth, wood, plastic, glass, or even wax. Finest detail is retained and mold life is practically indefinite. Part spoilage, "break-out" and patching or other maintenance on lay-up molds are eliminated; improved heat transfer, better curing, assure void-free parts.



Metallizing gun building up metal mold directly on plaster master

Finished mold. Note fine detail. Spraying time 28 minutes.

MODERN PLASTICS article describes method

The article, "SPRAYED METAL MOLDS," by *Dr. Walter Brenner* and *Leopold Hase*, of Brooklyn Polytechnic Institute, which appeared in the September MODERN PLASTICS, described the process in detail. We will be happy to send you a reprint of this article on request. Use the handy coupon.

Don M. Watson
METALLIZING ENGINEERING CO., INC.
38-14 30th Street
Long Island City 1, N. Y.

☐ Please send me free reprint of MODERN PLASTICS article: "SPRAYED METAL MOLDS."

☐ Please have Metco Field Engineer call.

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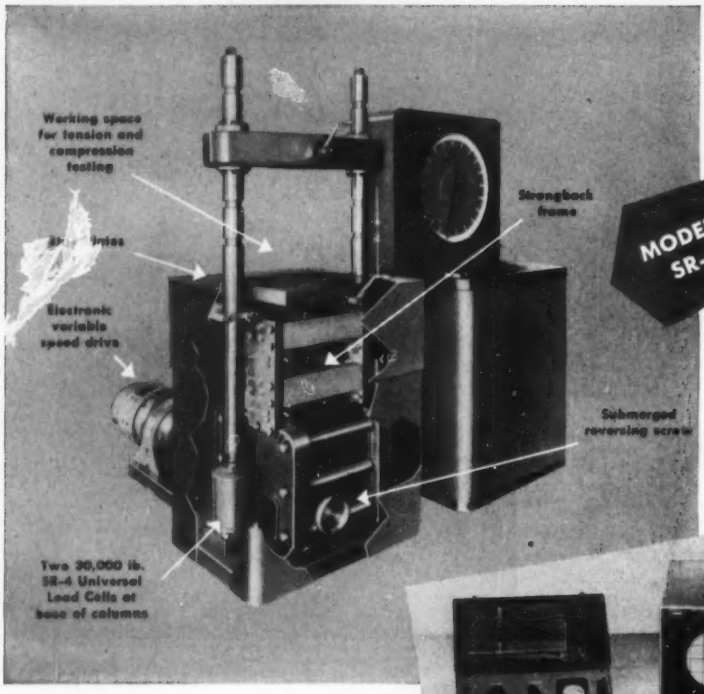
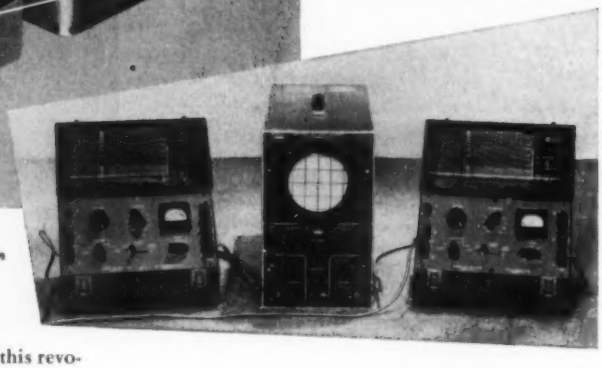


MODEL FGT BALDWIN-EMERY SR-4 TESTING MACHINE



Oscilloscope X-Y diagram system records stress-strain curves in shock testing

The extraordinary high speed of response of this revolutionary new Baldwin-Emery universal testing machine, paired with an oscilloscopic X-Y diagram, enables it to measure and record shock tests on complete structures. Its SR-4 load cells and SR-4 type extensometer make it capable of responding to the rates required by shock conditions.

The load cells and extensometer feed signals to the oscilloscope through pre-amplifier circuits. An instantaneous stress-strain curve and its two axes then appear on the oscilloscope screen. It is possible to have this screen photographed continually to record changes in the shape of the stress-strain curve as the structure itself changes.

Its unique aptness for such shock tests is one of the reasons why the FGT SR-4 Testing Machine is being recognized as *the greatest advance in materials testing equipment in twenty years.*

Full details on this latest contribution of Testing Headquarters are in Bulletin 4202. For your copy, write to Dept. 2226, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

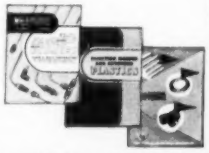
Palette and caps, molded for Beauty Counselors, Detroit, Michigan

Plastics Paths to Beauty

Beauty Counselor cosmetics saleswomen carry this palette in their direct-to-consumer work. Since it is in effect a travelling salesroom it had to be glamorous, impressive yet thoroughly practical.

Raymond Loewy Associates, designers, worked with this end in mind. Elmer E. Mills engineers and molding specialists carried on to complete this product, beautiful to see and easy to use. The nature of the piece required unusually close tolerances on the holes for close friction fit and to allow cam action. Close tolerances were also important so that the individual cosmetics containers go in easily and stay in, yet can be easily replaced when empty. The lettering on the palette was molded. Each of its 37 caps had lettering hot stamped.

This palette is one of numerous pieces which we have made to be used in sales work. It is also one of the many times when we have worked with a client's designer rather than doing the actual design. Call on us either way for molding that is skillful, sound and salesworthy.



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INJECTION MOLDED and EXTRUDED Thermo-Plastic Materials
Including Cellulose Acetate, Cellulose Acetate Butyrate, Acrylates, Methacrylates, Styrenes, Vinyls, Vinylidene Chloride, [redacted]*

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

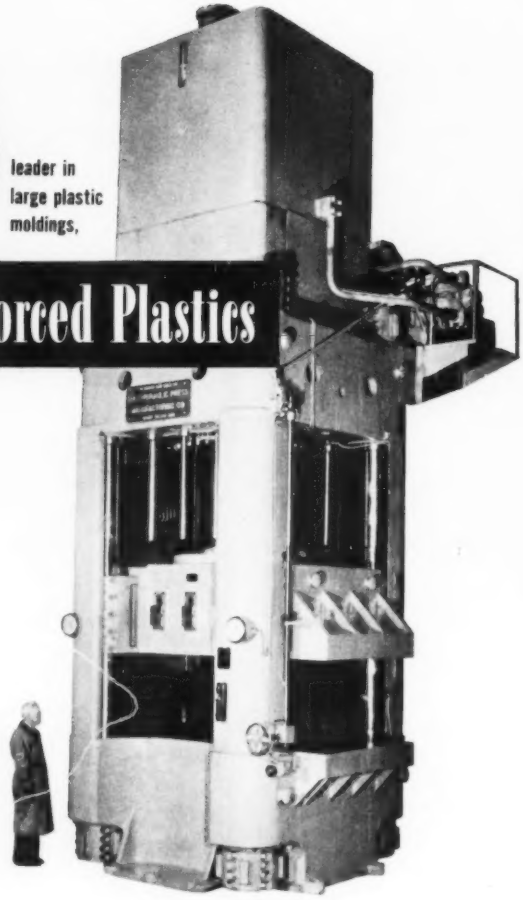
Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted] piping, tubing and fittings, write for circulars containing data and illustrations.*

*Trade Mark Reg.

Look to MPc

leader in large plastic moldings,

for Fiber-Glass Reinforced Plastics



From the beginning, **MPc** has been one of the leading compression molders of large phenolic parts, with an impressive record of industry "firsts." **MPc** now has available complete facilities for producing plastic parts of Fiber-Glass impregnated with the phenolics, ureas, melamines and polyesters.

Fiber-Glass, so fabulously strong and tough, lends itself to the production of plastic parts combining unprecedented strength, size and weight with many other special properties. Exploiting these possibilities to your best advantage is a logical job for **MPc.**

UNSURPASSED ENGINEERING AND TOOL ROOM FACILITIES

Product designers are invited to use **MPc's** extensive facilities for mechanical and electrical engineering and for material evaluation.

The **MPc** tool-room has produced the largest molds made in this country...and some of the smallest and most intricate molds. At **MPc,** the challenge of the new or unusual is met with inventive engineering skill...supported by the most extensive facilities operated by skilled craftsmen.

MOLDED MPc PRODUCTS

DIVISION OF
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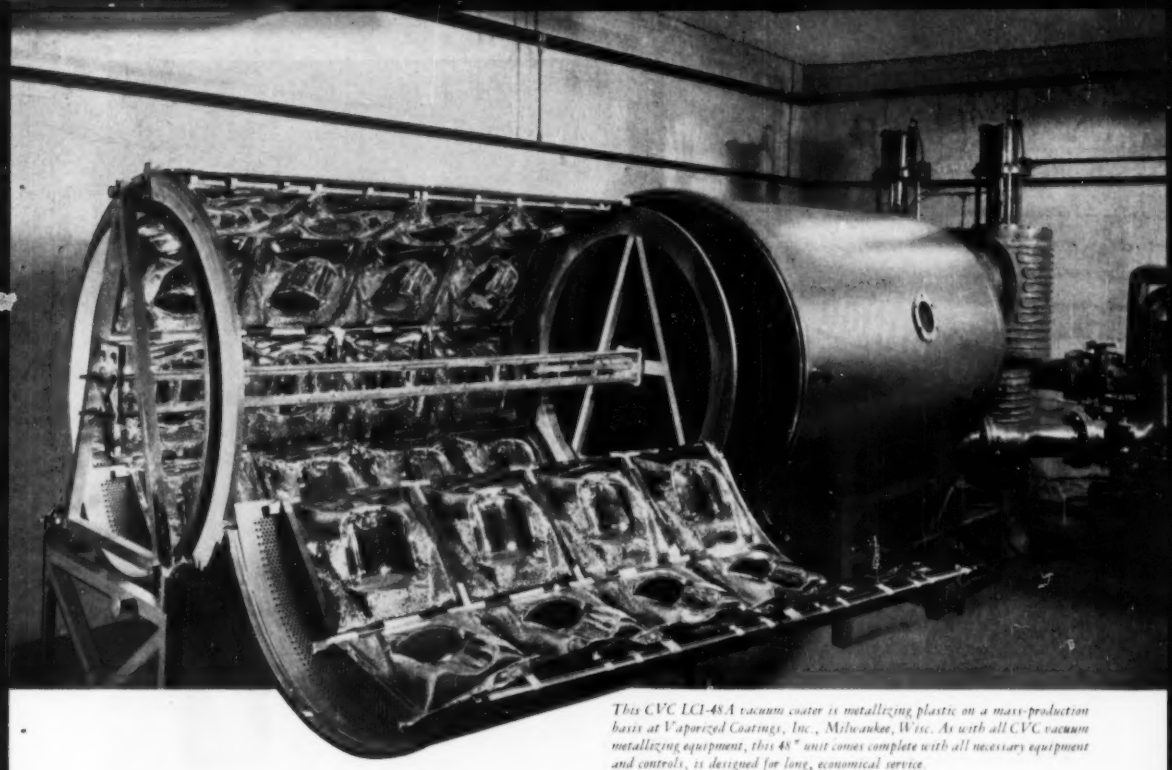
...Pace-Makers in Plastics Molding

MEMBER: COMMITTEE ON LARGE PLASTIC MOLDINGS OF THE SPI

FREE "Data Book of **MPc** Facilities," an engineering-eye view of **MPc** press capacities and other production facilities . . . together with a survey of **MPc** special skills available for your use. Write for your copy.



This CVC LCI-48A vacuum coater is metallizing plastic on a mass-production basis at Vaporized Coatings, Inc., Milwaukee, Wisc. As with all CVC vacuum metallizing equipment, this 48" unit comes complete with all necessary equipment and controls, is designed for long, economical service.

Large plastic pieces get a shine with CVC high vacuum metallizing

IF you've been wondering how a sales-compelling metallic mirrored surface can be produced on your large formed or molded plastic pieces, *CVC* has the answer—high vacuum metallization. And it's easy and economical with a *CVC Vacuum Coater*.

The large pieces are loaded on an extra long cylindrical fixture which opens to permit easy attachment at a convenient working level.

The entire fixture is rolled into the vacuum chamber, electrical connections are made, the door closed, and, in a matter of minutes, the load is coated with aluminum. Three cycles per hour are easy, four are possible.

All that remains to complete the operation is a paint or lacquer overcoat to protect the metal film.

Gold, copper, or other colors can be applied by coating the surface to be metallized with a tinted lacquer *before* metallizing.

Let *CVC* show you how to make more profit faster using high vacuum metallizing on large plastic pieces.

Consolidated Vacuum Corporation, Rochester 3, N. Y. (a subsidiary of Consolidated Engineering Corporation, Pasadena, California).

CVC

Consolidated Vacuum Corporation

Rochester 3, N. Y.

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designers and manufacturers of high vacuum equipment

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If you want to win in the Big Time Plastics Race... Remember—

Competition Won't Stand for "Merry-Go-Round" Methods

WELDING ENGINEERS Patented Dual Worm Compounder-Extractor-Extruders have the unique advantage of being first choice among America's leaders in the rapidly expanding plastic materials field. Performance earned that first place label, performance plus economy in power and labor. Give a Welding Engineers machine the toughest compounding - extruding assignment ever . . . and be prepared for amazing results: dry feed to finished product in a matter of seconds, difficult volatile extraction accomplished in stride, thorough mastication with a wide variety of blended feeds. These are the rule, rather than the exception.

Fundamentally, the Dual Worm design of Welding Engineers equipment is responsible for the leadership it has earned in the field. By permitting literally hundreds of worm combinations, each with a wide range of processing capabilities, this design makes every machine CUSTOM FITTED to the exact requirements of the customer. And, because of the variety of sizes and capacities in the Welding Engineers line of Compounder-Extruders, it is just plain good engineering sense to investigate the merits of Welding Engineers machinery before you invest in *any* equipment.

With competition in high gear, your position in the big time plastics race can depend on the efficiency and flexibility of your compounding, extracting and extruding. One machine, one operator, one floor space assignment! These are routine advantages with our dual worm machines. Others: stamina that permits continuous operation, 24 hours a day, every day in the year; low power consumption, and uniform quality product.

Write today for your copy of our General Catalog on the Applications of Welding Engineers Compounding-Extracting-Extruding Equipment.

WELDING ENGINEERS, INC.

NORRISTOWN, PENNSYLVANIA • MANUFACTURERS OF IMPROVED ONE-OPERATION MACHINERY FOR THE PLASTICS, CHEMICAL AND PETROLEUM INDUSTRIES

HIGH QUALITY at LOW COST

for reinforced polyesters

If you're seeking ways to get better polyesters at low cost, let us recommend the right DIAMOND Precipitated Calcium Carbonate for your product.

You'll get smoother surfaces, no cracks, no evidence of glass fibers when DIAMOND Carbonates are mixed with catalyzed, glass-reinforced polyesters. And your product gets improved wet strength and reduced shrinkage.

All these at lower volume cost.

DIAMOND offers these precipitated calcium carbonates for reinforced polyesters:

Surfex® MM—coated with 1% resin; particle size about 5 microns.

Suspenso®—same as Surfex MM, but uncoated.

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Write for DIAMOND technical bulletin: *The Use of Precipitated Calcium Carbonates in Reinforced Plastics.*

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MILL THE BEST HOB AND MOLD CONTOURS

. . . and it's easy to see why, because CINCINNATI Monoset Cutter and Tool Grinders are completely universal . . . you can accurately grind any shape desired. Three typical examples are illustrated below. ¶The Monoset is tops for re-sharpening jobs; for salvaging broken cutters; for making cutters from solid bar stock. Here are the pay-off features of Monoset:

1) Built-in mechanism for infinitely variable spiral leads
2) Workhead swivel mount for generating accurate radii
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4) Simple, accurate indexing devices
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These and other Monoset features mean accurate, low-cost cutters that produce smoother, more accurate contours in molds and hobs. Every tool and die shop needs a CINCINNATI Monoset. You will find brief specifications in Sweet's Machine Tool Catalog. Complete information in our catalog No. M-1591-1.

THE CINCINNATI MILLING MACHINE CO.
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Grinding the flutes at the end of a ball nose die sinking cutter, on a CINCINNATI Monoset Cutter and Tool Grinder.

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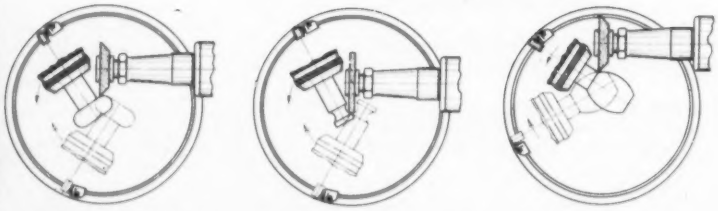

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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Spaulding PRODUCTS for INDUSTRY provide STRENGTH

PLUS Good forming
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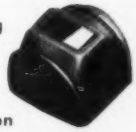

...as in protective headgear

PLUS Toughness
Inertness to oils, greases, waxes, and solvents
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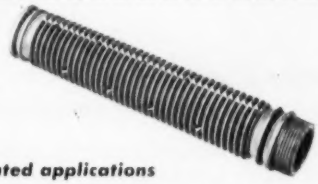
PLUS Ease of machining to a glass-smooth surface
Absence of chipping, splintering, corroding, or staining
Toughness
Lightness



...as in textile and related applications

High mechanical strength is a required property of the basic material for many parts and components. It is seldom, if ever, the only property to be considered.

The various types and grades of Spaulding products offer strength in a wide range of combinations with other mechanical, electrical, and chemical properties.

If the material you seek should have strength plus other properties—or any difficult or unique property combination—consult the Spaulding Handbook or your nearest Spaulding Branch Sales Office.

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Metasap* Stearates

provide

superior lubricants in molding compounds

If you must meet competition with quality molded products, and yet keep a tight rein on costs, you'll find no greater aid to profitable production than Metasap Stearates.

These metallic soaps provide outstanding lubrication—whether incorporated into molding compounds or dusted onto surfaces of mold cavities. Using them, you will eliminate preform delamination and breakage of finished products, *because ejection pressures will be reduced to a minimum.*

We particularly recommend:

Metasap Zinc Stearate
Metasap Calcium Stearate

For unusually intricate mold designs, and precision fabrication, this excellent lubrication will prove especially advantageous.

outstanding thickeners for plastisols

If you manufacture plastigels, you'll find Metasap Stearates top-notch gelling agents. Moreover, the *ready availability* of these scientifically prepared metallic soaps and the *basic economy* they afford are factors which help cut production costs—enable you actually to save money without sacrificing quality.

We'll be pleased to supply you with *free* samples of:

Metasap Magnesium Stearate **Metasap Barium Stearate**
Metasap Calcium Stearate **Metasap Aluminum Stearate**

—so that you may select just the thickener, or thickeners, you require for the plastisols you are handling.

*Reg. U. S. Pat. Off.

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of Calcium • Aluminum • Lead • Magnesium • Zinc

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Equipped to take reels up to 36" in diameter. Cam-and-lever lift from floor. Mechanism is automatically self-braking, with brake activated by any slackening of wire speed. Rugged construction.

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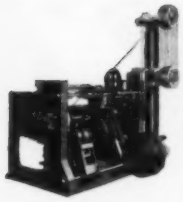
Drag and pulling type. Supplies for almost all wire plant needs. Aluminum or cast iron drums, grooved or flat, in any radius desired. Gear reducers standard, four-speed transmission optional.



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Great new efficiency. Quiet, vibrationless. No gears or clutches. Operates positively at high speeds. Reel drive by multiple V-belts. Automatic brake. Totally new traverse mechanism. Speed range choice for constant tension control. Built in two sizes: for reels 12" to 24" and 24" to 36".

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Heavy duty model assures uniform curing at high production rate. Made in 3¼", 4½", and 6" bore sizes for hot or cold fed compounds.

When is an Extruder an *Excluder*?

When it's a DAVIS-STANDARD

When you purchase superior extrusion equipment, you *exclude* troubles. That's why more and more companies are installing Davis-Standard extrusion equipment. They know that it *pays* to buy extruding machines from the world's largest manufacturer of custom-made extrusion equipment for rubber and thermoplastics.

Davis-Standard extruders assure high-velocity extrusion, maximum operating efficiency, and are available with accessory units which mean satisfying, profitable production.

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EXTRUDING MACHINES AND MOLDING PRESSES

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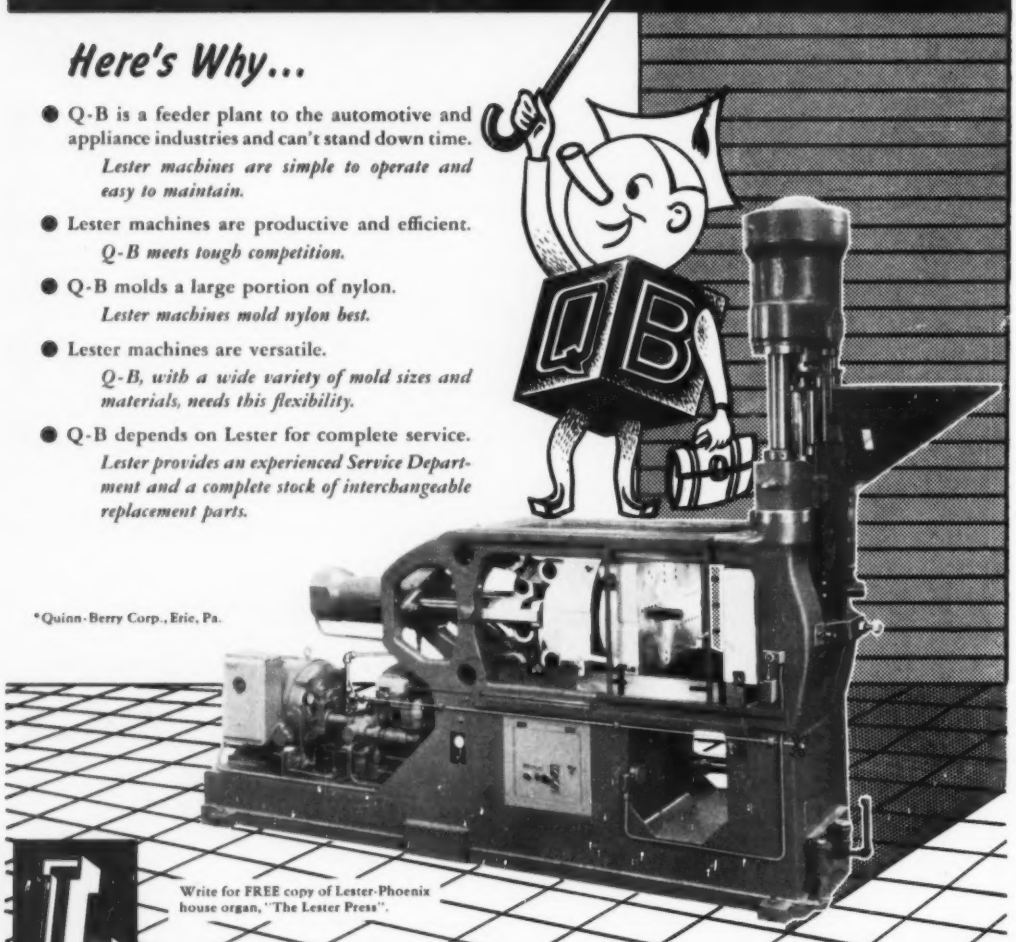

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IF YOU DRILL HOLES

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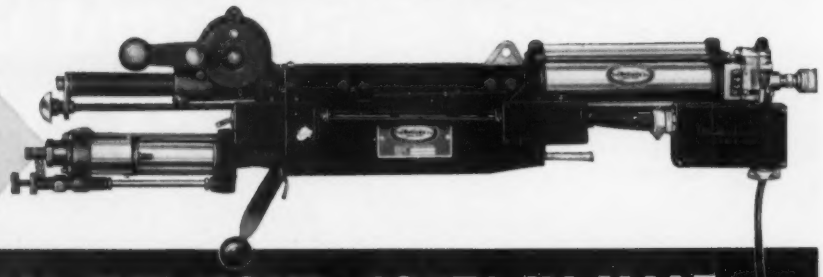

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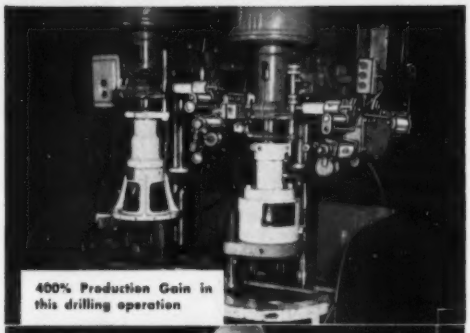

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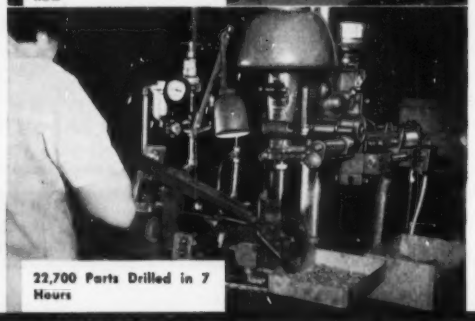

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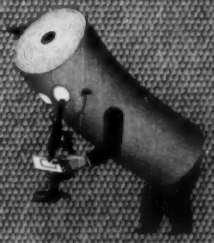

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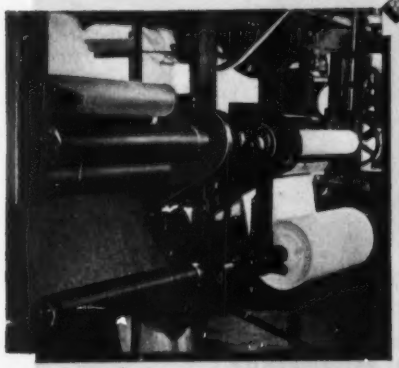

One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here fabric thickness after weaving is being gauged.

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Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric — cotton, synthetic or blend — to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

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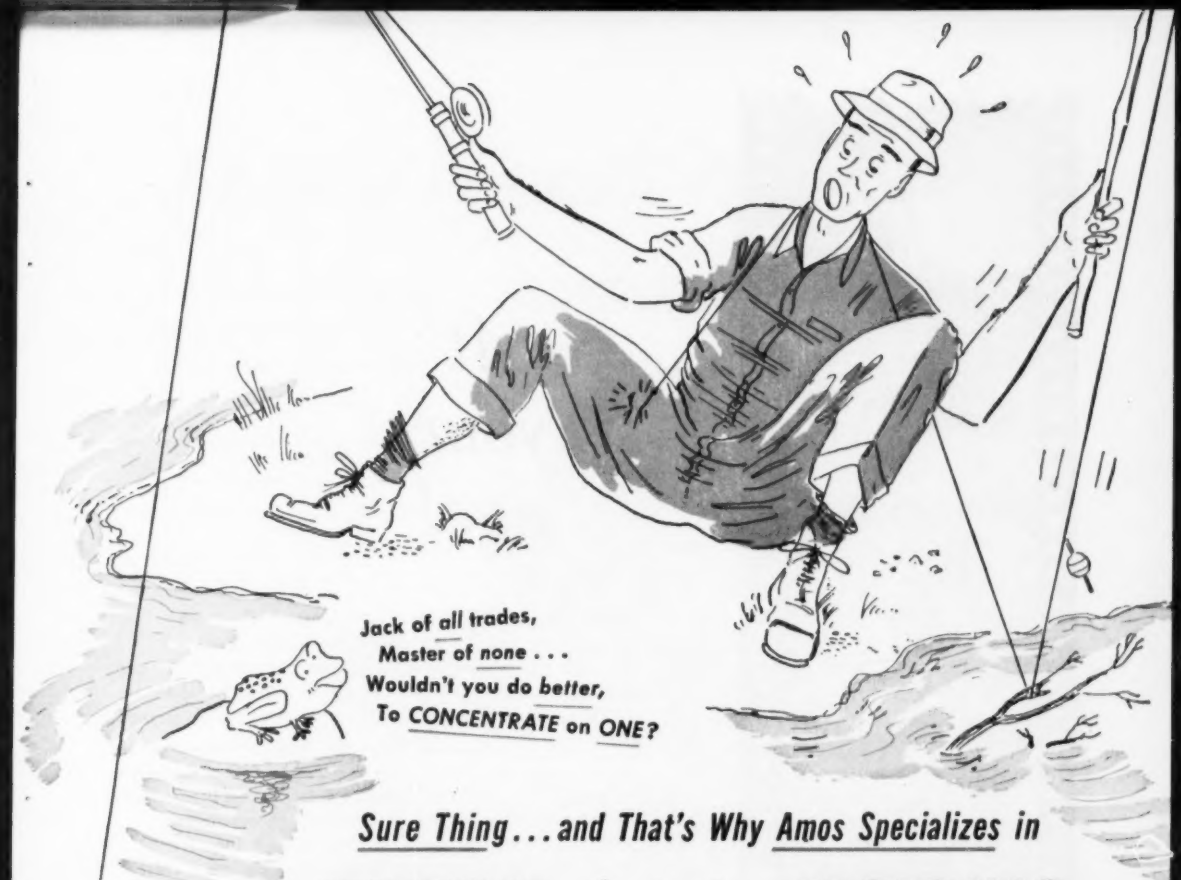

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▸ Yet, at the same time, Amos is small enough to give close personal attention to "painstaking" details—*expert specialization every step of the way*—that means Jobs Done RIGHT . . . and pleased customers.

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At your age!

If you are over 21 (or under 101) it's none too soon for you to follow the example of our hero, Ed Parmalee, and face the life-saving facts about cancer as presented in our new film "Man Alive!". You'll learn, too, that cancer is not unlike serious engine trouble—it usually gives you a warning:

(1) any sore that does not heal (2) a lump or thickening, in the breast or elsewhere (3) unusual bleeding or discharge (4) any change in a wart or mole (5) persistent indigestion or difficulty in swallowing (6) persistent hoarseness or cough (7) any change in normal bowel habits.
While these may not *always* mean cancer, any one of them should mean a visit to your doctor.
Most cancers are curable but *only* if treated in time!

You and Ed will also learn that until science finds a cure for *all* cancers your best "insurance" is a thorough health examination every year, no matter how well you may feel—twice a year if you are a man over 45 or a woman over 35.

For information on where you can see this film, call us or write to "Cancer" in care of your local Post Office.

American Cancer Society

MAN ALIVE! is the story of Ed Parmalee, whose fear weakens his judgment. He uses denial, sarcasm and anger in a delightful fashion to avoid having his car properly serviced and to avoid going to a doctor to have a symptom checked that may mean cancer. He finally learns what a difference it makes (in his peace of mind and in his disposition) to know how he can best guard himself and his family against death from cancer.

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which has maintained
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will continue to be sold,
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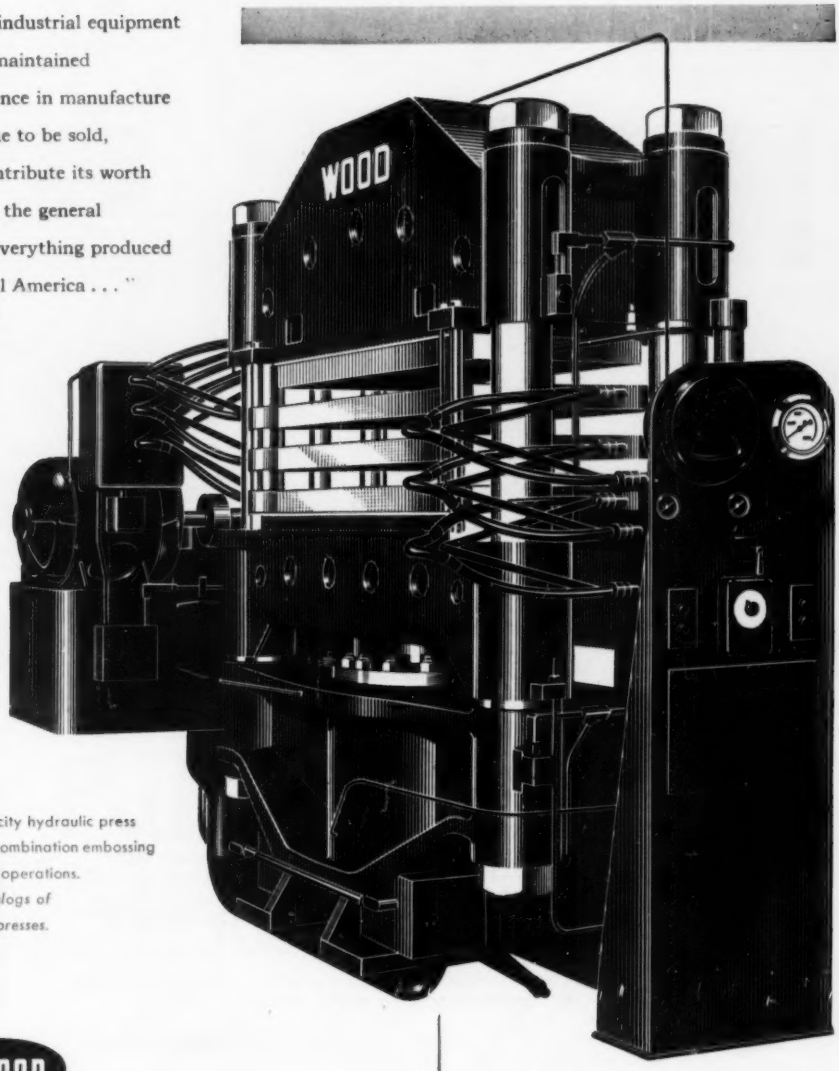

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Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

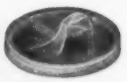
The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Germany Patent 829,248 September 25th, 1949. Great Britain Patent 662,219 September 27th, 1949. Argentina Patent 96,970 September 30th, 1949. Brazil Patent 39,676 December 29th, 1950. Other U. S. and Mexico Patent 51,615 January 3rd, 1952. Other U. S. and Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.



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FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Por Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.

The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

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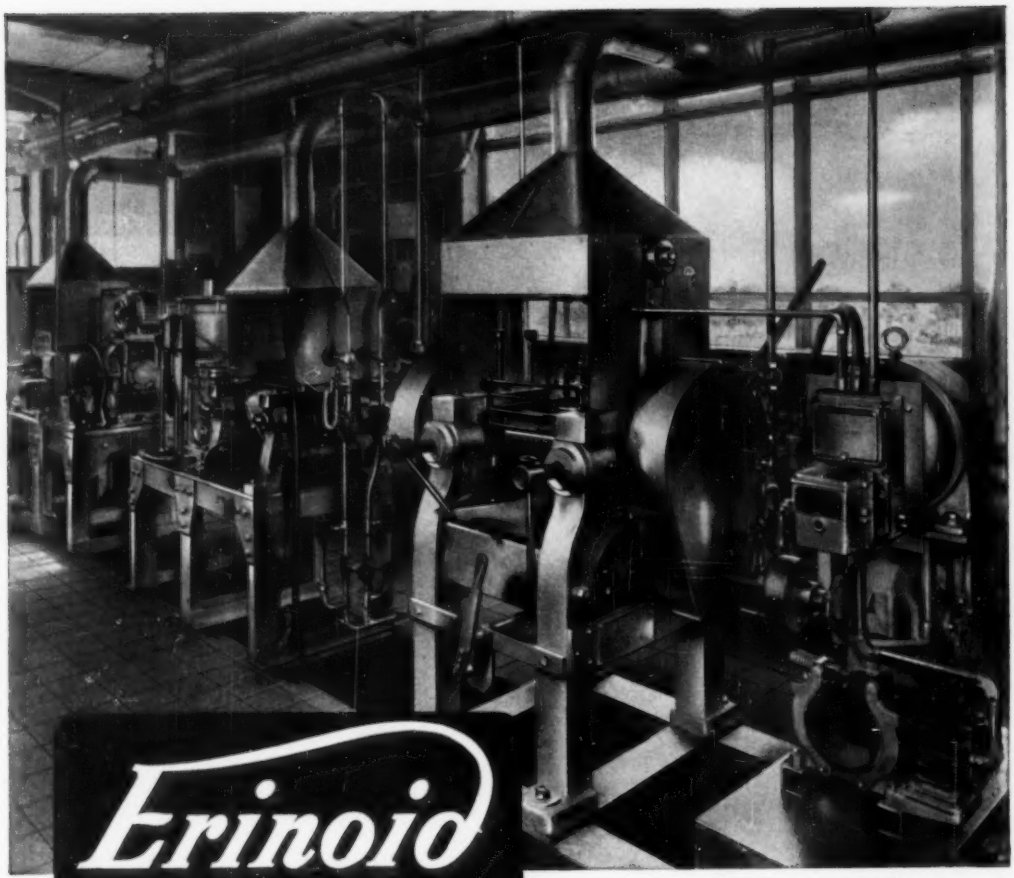

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—for SYNTHETIC RUBBERS

Emery Monomeric plasticizers are noted for their low temperature properties . . . . . their stability to light and heat . . . . and their outstanding resistance to oxidation and rancidity. Practically water-white . . . they have low pour points, low specific gravities and low volatilities.

The Polymeric types are special polyesters that are designed to supply permanence and durability. Although Polymeric in nature, they are sufficiently fluid at normal temperatures to be handled in bulk with ordinary equipment.

Check these Plastolein Plasticizers for those applicable to your Operation—

PLASTOLEIN 9050 DHZ

(di-2-ethylbutyl azelate)—a highly-efficient specialty plasticizer for high clarity films, coated fabrics, extrusion compounds and other elastomers where low-temperature flexibility is essential. Excellent for the viscosity control of dispersions.

PLASTOLEIN 9058 DOZ

(di-2-ethylhexyl azelate)—a good all around basic plasticizer that also imparts excellent low temperature properties. Its outstanding combination of properties leads to its use in any vinyl product. Also advantageous for nitrile and GRS rubbers.

PLASTOLEIN 9057 DIOZ

(di-iso-octyl azelate) a good basic, primary plasticizer for all vinyl formulations. For all practical purposes, its performance is the same as that of Plastolein 9058 DOZ and both can be used interchangeably.

PLASTOLEIN 9055 DGP

(diethylene glycol dipelargonate)—a general purpose auxiliary plasticizer for imparting low-temperature flexibility, excellent "hand" and drape to vinyls. Also, an outstanding low-temperature plasticizer for Neoprene and Buna-N rubbers.

PLASTOLEIN 9250 THFO

(tetrahydrofurfuryl oleate)—a fatty type plasticizer of unusual stability, providing internal lubrication for superior processing. Also imparts excellent "hand" and drape to films and sheeting. Its relatively low cost makes it attractive for cellulosics, particularly nitrocellulose, and synthetic rubbers.

PLASTOLEIN 9715, 9720 POLYMERIC

These Polymeric Plasticizers impart extreme durability and weatherability to plastic materials, yet exhibit the low-temperature characteristics and high efficiency of most monomeric plasticizers. They are compatible with the vinyls, cellulosics and synthetic rubbers. Prolonged exposure to heat and ultraviolet light does not result in appreciable discoloration, stiffening, or sweat-out.

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Be certain your plastics remain plastic! Specify { EMERY PLASTOLEIN PLASTICIZERS *every time!*

MODERN mp PLASTICS

AUGUST 1953 VOL. 30, NO. 12

Courtesy International Business Machines Corp.

More than 60,000 plastics parts used in the assembly of the IBM electronic data processing machines, type 701, contribute to efficient operation

Millions and Millions Of Plastics Parts Go Into MACHINES THAT 'THINK'

IMAGINE a machine that in less than an hour can do all the calculations necessary for a payroll of 15,000 workers—and can even instruct another machine to type the checks! Imagine a machine that, on being fed mathematical formulas from blueprints can direct on a fully automatic basis an enormous tool making shop! Imagine a machine that can accomplish in minutes aerodynamic calculations for guided missiles that would by any other method require many man-years!

You don't have to have much imagination for this exercise: such machines are here today.

Popularly referred to as machines that "think," actually they don't think; they remember, and they perform simply logical mathematical calculations on the numbers

Photos both pages courtesy International Business Machines Corp.

IBM electronic data processing machines, type 701, consists of 11 compact and connected units—contains nine types of plastics

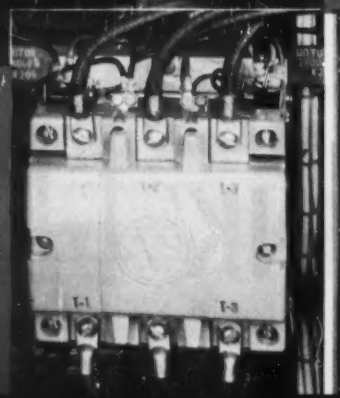
they are given to remember, making available to their users the results of those calculations at any desired time.

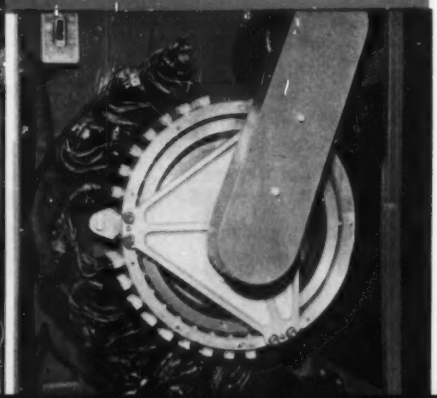
Two Basic Types

There are two basic types of such machines: the digital type and the analogue type. The digital type is something like a Chinese abacus; it adds and subtracts—but at superhuman speeds. It may be given numerous choices of procedure paths at any point in its calculations. For example, it can be instructed that if the total of addition in factor A, when that is completed, is less than the total of addition in factor B, B should be subtracted from A before calculations proceed further; and if the reverse is true at that point, A should be multiplied by any one of several other factors. The analogue computer is fed, not numbers, but blueprints, models, scale drawings, graphs, and logarithmic formulas and equations. The analogue computer does not require the vast "memory storage" facilities needed by the digital type, being designed for a different purpose. Both types are today an absolute necessity in nuclear science, in aircraft and guided missile design and control, in combinatorial analyses related to our fabulous future.

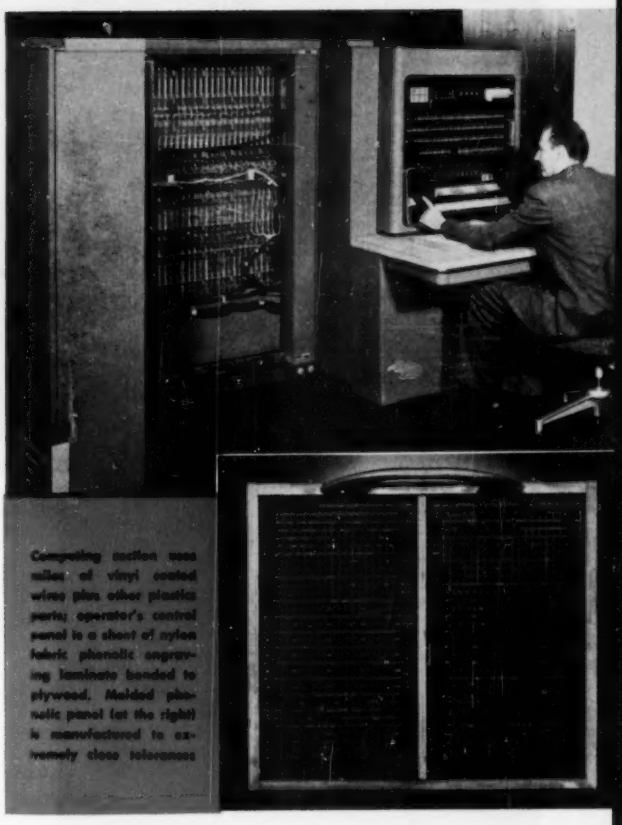
The construction of both digital and analogue electronic computers involves the use of huge quantities of plastics components—and as newer models are evolved, more

"Reading" and "writing" heads (far right), used to store and read information on drums (above), are inserted in a Bakelite C-11 molded styrene holder. Each holder has a nylon plug and the wire is protected by a vinyl plastisol sleeve. Magnetic contactor for this section has molded alkyd housing (right)





Magnetic drum "reading" and "writing" heads are only 0.001 in. from surface of fast-turning drums



Computing section uses miles of vinyl coated wires plus other plastics parts; operator's control panel is a sheet of nylon fabric phenolic engraving laminate bonded to plywood. Molded phenolic panel (at the right) is manufactured to extremely close tolerances

and more plastics will be used in them.

For the purpose of this article, let's look at two digital computers and one analogue type.

First is the IBM electronic data processing machine, type 701, successor to the famed IBM selective sequence electronic calculator, but 25 times as fast in its operation and one-fourth the size of its predecessor. Its design involved much use of plastics.

The 701 is composed of eleven compact and connected units. These are the card recorder, card reader, power supply units, power distribution control, electronic analytical control unit, alphabetical and numercial printer, two magnetic tape storage units, one magnetic drum storage unit, and one electrostatic storage unit. Three different types of "memory" storage units are used so that the machine can select for any purpose the one which is most suitable in speed and capacity for the particular part of the work in hand.

The electrostatic storage unit, consisting of 72 cathode ray tubes, can store the equivalent of more than 20,000 decimal digits, and it is very fast on input and output; data can be placed in storage or obtained from it in 12/1,000,000 of a second. The figures appear as minute dots of light on the faces of the tubes.

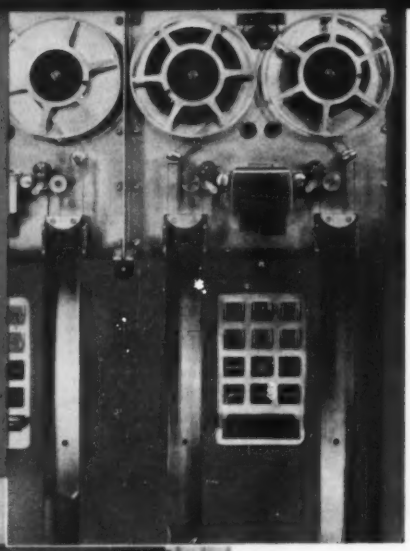
The second type of storage is the magnetic drum, two of which are in each unit. Two drums can store 81,920 decimal digits as magnetized spots of data while the drums spin at a speed of 2929 revolutions a minute. Any number stored is available in 40/1000 second.

The third type of memory storage is an acetate base magnetic tape, and provides greater memory storage capacity. Up to 12,500 decimal digits a second can be introduced or taken off the magnetic tape, and capacity is in excess of 2,000,000 digits for each reel of tape. This unit is used largely for intermittent handling of data at the tremendously high speeds involved.

The actual calculations in the IBM 701 machine are performed in the electronic analytical control unit. There are 274 pluggable electronic unit assemblies which perform all the computing and control functions by means of electronic pulses emitted at speeds ranging up to 1,000,000 a second. Each of these pluggable units is mounted on a phenolic-fabric molded chassis, with resistors, plastic encased and coded in color as to resistance value and tolerance, a group of capacitors, germanium diodes, and vacuum tubes, with vinyl coated wire for assembly.

All pertinent numbers initially fed into the computer and representing both the digits to be processed and instructions as to the procedures which are to be followed are "read" by a sensing station. Sensing station is literally a block of phenolic random weave fabric laminate with holes machined in it and with 80 multiple strand brushes and their connecting plugs. The brushes complete electrical circuits and any lack of dimensional stability or lack of close tolerance would be disastrous. An interesting plastics development is involved in the future of this particular device: the company is studying the possibility of molding the part from glass-filled alkyd.

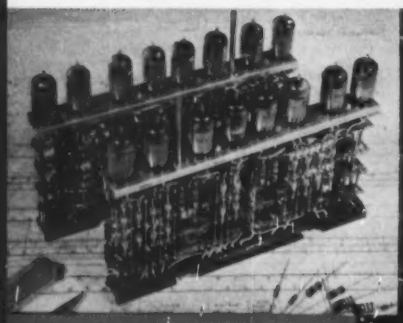
The analytical control unit can

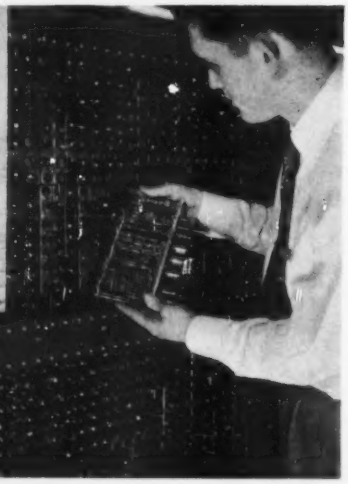


Acetate base magnetic tape in tape reader and recorder can introduce or record data at a rate of 12,500 digits a second

Tape, which is wound on metal reels with phenolic cores, passes at tremendous speeds over molded nylon bearing rollers

Photos this page courtesy International Business Machines Corp.





Computing and control functions are performed by a series of 274 plug-pable electronic units (right). Each unit (above) is mounted on a phenolic-fabric molded chassis. Vinyl coated wire and epoxy pottings are also used

perform more than 16,000 addition and subtraction operations per second, more than 2000 multiplication and division operations per second. It can also assess the storage requirements of the segment of the problem and select tape, drum, or cathode ray storage for any certain group of factors. It assembles the calculations and delivers them to the output section on either a printer which operates at the rate of 1050 ten-digit numbers a minute or on punch cards at the rate of 2400 ten-digit numbers per minute. Naturally, input and output of the IBM 701 is much slower than the calculating ability of the machine, so that the machine can actually work any problem forwards and backwards several times while waiting for the answer to be recorded.

Specific Parts

The author added up more than 60,000 plastics components in the group of machines known as the 701. Starting with the card reader unit we find on the top a molded butyrate card aligning joggle plate whereon the cards may be bounced into straight order. As the cards are fed into the machine, they pass over rollers made of linen based phenolic. The decorative strip around this unit is extruded butyrate. Electronic devices inside are, of course, fastened to high pressure paper and fabric phenolic laminates. Even the weight used to hold down a stack of cards in the machine is molded acrylic. It retains its good appearance, does not chip or mar, and its transparency is an advantage.

The operator's control panel is made of a sheet of nylon fabric phenolic engraving laminate bonded to moisture-resistant plywood. Escutcheons and buttons on this unit, as on all others in the machine, are of two types. One type is transparent acrylic with colored transparent vinyl back inserts so that light may shine through; the other type is molded butyrate, engraved and with wipe-in color used for the numbers.

Naturally, all wire harness is vinyl coated and the harness assemblies are made up of different colors of wire, suitably coded. Terminal boards are molded phenolic, or fabricated phenolic laminate, or rubber phenolic. One of the most

Photos this page courtesy Remington Rand, Inc.

Universal automatic computer, known as Univac, incorporates more than 50,000 plastics parts

accurate pieces of molding ever done is on a small molded general purpose phenolic control panel unit where hole locations are held to plus or minus 0.007 in. from center to either end, and hole diameters are held to +0.002 in. and −0.000 inch. The problem of dimensional accuracy in this case was overcome by special design heating units in the molds and location of core pins by alternate grouping from both cavity and force side of the mold.

Molded phenolics again appear in most of the knobs on the units, laminated phenolics in tube bases, relay terminals, and protective tubes in the input bank.

Large Terminal Blocks

Alkyd makes its appearance in the large terminal blocks in the power distribution unit. In the tape storage unit, cores of the metal tape reels are of molded phenolic, switches are molded of melamine, bearing rollers over which the tape passes at tremendous speeds are nylon, and the protecting panels are fabricated cast acrylic. The tape itself is acetate containing an iron compound to make it magnetic.

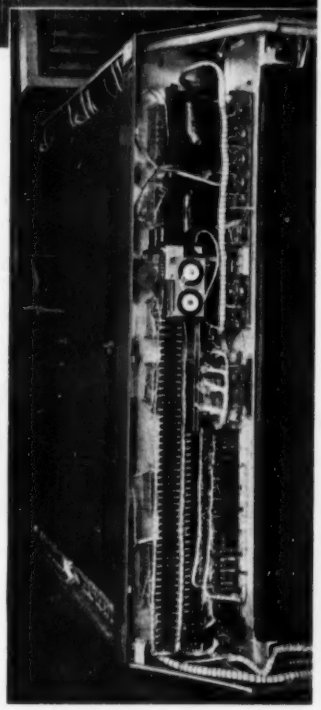
The heads of the "writers" which pass information to the drums in the drum storage unit are 0.001 in. away from the surface of the drums which are revolving at almost 3000 r.p.m., each digit being recorded as a small magnetized spot on the face of the drum. Naturally, insulation and resilience are factors. Each group of "writers" is inserted in a holder made of Bakelite C-11 copolymer, and each holder covered with a molded nylon plug, the wire being attached through this and effectively protected by a vinyl plastisol sleeve.

Unseen even when the machine units are open are the uses of polyvinyl chloride platens on some of the printers; thousands upon thousands of miniature insulation parts, largely phenolic laminates; epoxy, phenolic, and copolymer adhesives; miniature nylon coil bobbins; and urea components for relays. One tiny contact relay assembly involves the use of six different plastics. Finally, the very wheels on which the units of the IBM 701 roll are molded from high impact phenolics.

While a total of 18 type 701 will be built within a year, IBM has already placed in use in industry 2000 smaller "commercial" type electronic calculators. Extensive research is under way on new and more versatile computers.

Universal Automatic

The other important digital electronic computer is the equally famous Univac, known as the universal automatic computer. This computer is devoted to higher mathematical problems in applied science, but is also geared to commercial work. It is manufactured by Eckert-Mauchly Div., Remington Rand Inc., and is composed of a group of units including control, metallic magnetic tape input-output devices, a central computer, keyboard-to-tape, and tape-to-printed copy transcribers. The central computer uses both metallic tape and



Backboards visible in an exposed corner of Univac (above) are phenolic. Smaller parts (below) include magnetic tape bonded to polyester tape (top); molded nylon bearing (left); and spring bonded in epoxy resin

Courtesy The National Cash Register Co.

Housings removed from analyzers show the many plastics parts used in the complex structures

Courtesy *Steelways Magazine*

Calculation and test work on guided missiles is done by analogue computer known as "Typhoon"

an acoustical mercury memory for storing data.

The Univac is a successor to Edvac, Binac, and Eniac and is the result of over ten years of development on the part of Remington Rand.

The Univac features input and output in closer balance with speed of calculations, and its metallic tape system can read or record at a rate of more than 10,000 digits a second—equivalent to punching numbers on cards at 7000 cards a minute.

Univac also features a complete system of built-in checking. Every arithmetic operation is duplicated by two entirely independent units simultaneously, and the results of each step are compared. The special checking circuits keep tab on all operations and any deviation at any place or time in the calculation stops the machine and points to the section of circuit in which the deviation that has been recorded might take place.

The Remington Rand claim is that one-half of all the kinds of information retained in man's mind can be retained in the Univac, and three-fourths of all the kinds of data processes that men do can be done by it. It handles not only numbers but the alphabet as well as punctuation. Three units are involved. The Unityper converts facts from a typewriter to pulses on a metallic tape; the Uniservo transfers data into and out of the central computer by reading from or recording on the magnetic tape at a rate of over 10,000 digits per second while the tape is moving at 100 in. per second; and the Uniprinter converts the tape-recorded data into printed copy.

Over 50,000 plastics parts are used in the Univac. Standard, of course, are the phenolic laminate and molded phenolic terminal and plug-in boards, tube bases, acrylic dust covers, phenolic knobs, etc. But there are some unique applications of plastics in Univac. Pulleys and bearings for the metallic magnetic tape in the Uniservo are nylon, which replaced aluminum with great success. The leader which feeds the metallic tape through the mechanism is Monel tape. Remington Rand engineers are considering replacing the Monel with Mylar. Although Scotch tape, S-41, successfully attaches the metallic recording tape either to the Monel or the Mylar, there still is no satisfactory adhesive for attaching Mylar to itself in the form of a small loop. At present a small rivet is used and so far has proved satisfactory. A nylon cord under tension helps the Uniservo achieve top speed of 100 in. per second in less than 1/100 of a second. New miniature components are potted in epoxy casting resin.

An acrylic case is used in place of glass in the Univac to pot the germanium diodes. In the capacitors, Mylar film replaces mica because of its improved heat resistance and dimensional stability.

A most interesting use of epoxy in Univac is a flexible form of the material which encases a spring for dampening purposes—to prevent too much bounce and to provide silence.

Remington Rand's philosophy of the future of electronics in computing is expressed in a research program devoted to the production of smaller, more compact, but equally versatile machines suitable for general commercial and government use. Insurance billing, payroll operations as mentioned above, calculations of huge numbers of bank accounts, market analysis, weather prediction, production scheduling, stock control, and air lines reservation analysis are all grist to the Univac. Indeed, the U. S. Bureau of Census is one of the first big users.

While IBM and Remington Rand have produced the biggest and most versatile electronic digital comput-

(*Continued on* p. 180)

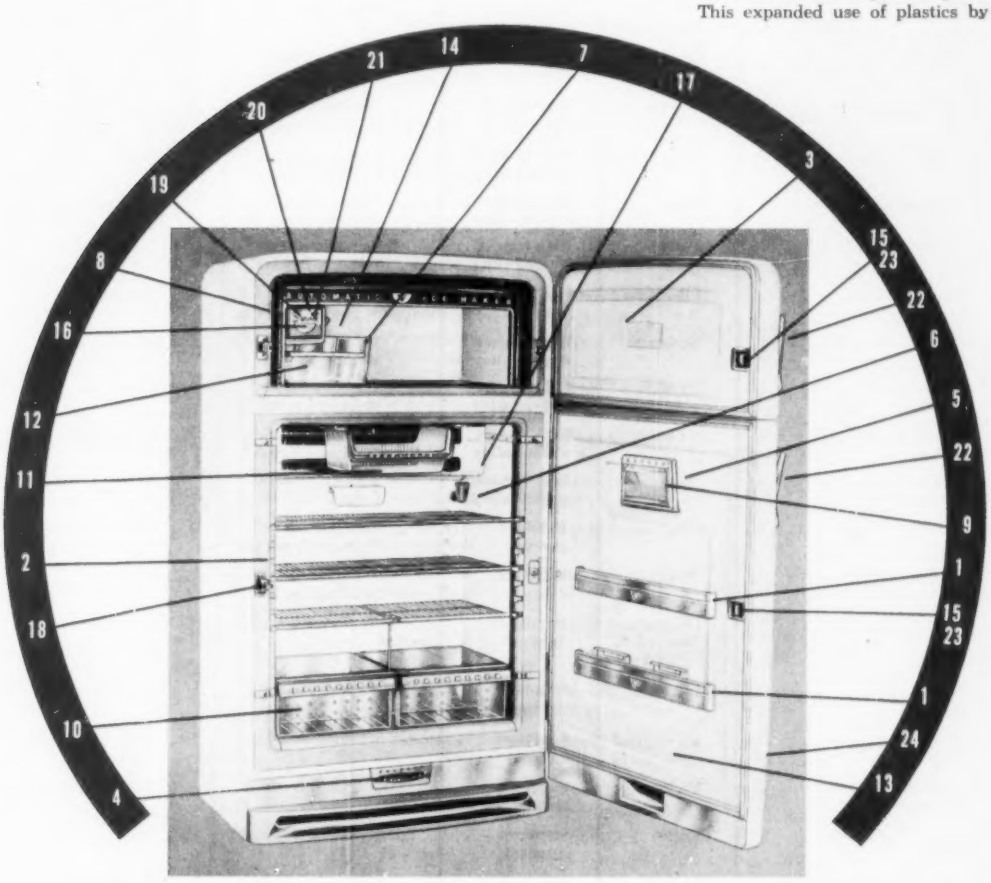
REVOLUTIONARY REFRIGERATOR

More than 23 lb. of a wide variety of plastics are used in new machine which automatically replenishes ice cubes as they are removed from storage basket

FROM a smattering of minor components in the refrigerators of the early thirties, plastics parts have mushroomed into a major feature of today's streamlined refrigerators —and the "all-plastics" model is not too far over the horizon.

Last year, for example, Servel, Inc., Evansville, Ind., incorporated in their 9 cu. ft. model some 16 lb. of plastics—a figure that represented a new high in the company's use of plastics for refrigerator applications. Yet today, only one year later, Servel's 1953 Automatic Ice Maker, has more than 23 lb. of plastics parts.

This expanded use of plastics by



Main plastics components of the Automatic Ice Machine, some of them hidden in the locations indicated, are as follows: 1) door pan shelves; 2) lower door molding; 3) upper door liner; 4) temperature control dial; 5) butter keeper housing; 6) defrost drain cups; 7) ice maker signal; 8) evaporator molding; 9) butter keeper door; 10) vegetable fresheners; 11) odds and ends basket and slides; 12) ice storage basket; 13) lower door liner; 14) coupling between ice maker ejector and motor; 15) latch striker block; 16) ice maker mold back; 17) automatic defrost drain tube; 18) latch handle bumper; 19) ice maker insulation cover; 20) water inlet tube; 21) electrical wiring inlet to ice maker; 22) door handle cover; 23) latch mechanism roller; 24) door gasket. A complete parts chart starts on next page

Servel is the offspring of aggressive engineering and merchandising policies revolving around the new Automatic Ice Maker.

This automatic freezing machine, which is furnished in gas absorption, electric absorption, or electric compression models, makes ice cubes without ice trays, stores them in a container, and automatically replenishes them as they are used.

In the operation of the ice-making mechanism, a measured amount of water is first led into a special mold located in a compartment in the upper left-hand corner of the refrigerator. When the water in the half-moon shaped molds freezes, a small electric heater loosens the cubes and an ejector arm sweeps them out of the mold. The cubes are held by the ejector arm at the top of the unit until they are dry and they are then dropped into the special ice basket. While the cubes are being held in the air, more water flows into

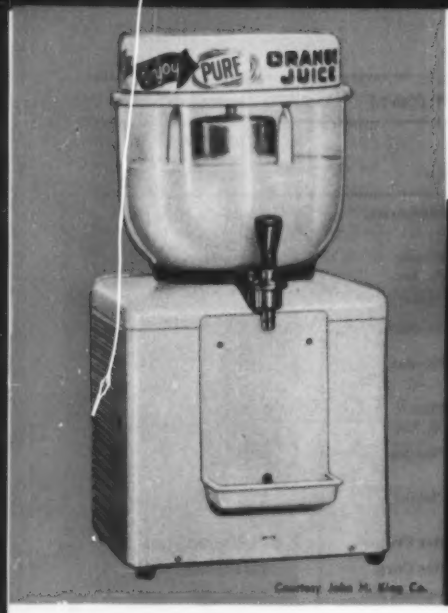
(*Continued on p. 192*)

PLASTICS COMPONENTS IN NEW SERVEL AUTOMATIC ICE MAKER

Name	*Quan.*	*Wgt. per Unit*	*Material*	*Vendor*	*Part Status (New, Replaced Steel, Etc.)*
Door pan shelf	2	8 oz. each. Tot. 1 lb.	Styrene copolymer	Kusan, Inc.	New
Egg tray	2	2½ oz. ea. Tot. 5 oz.	Standard styrene	Tri-State Plastic Molding Co., Inc.	New
Molding—bottom	1	13½ oz.	High impact styrene alloy	Panelyte Div. St. Regis Paper Co.	Plastic last year
Molding—top	1	7 oz.	High impact styrene alloy	Panelyte Div. St. Regis Paper Co.	Plastic last year
Molding—right side	1	9 oz.	High impact styrene alloy	Panelyte Div. St. Regis Paper Co.	Plastic last year
Molding—left side	1	9 oz.	High impact styrene alloy	Panelyte Div. St. Regis Paper Co.	Plastic last year
Upper door pan	1	1 lb., 13 oz.	High impact styrene alloy	Panelyte Div. St. Regis Paper Co.	Plastic last year
Temp. control dial	1	3½ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	Plastic last year
Butter keeper housing	1	7½ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	New
Drain trough	1	1¼ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	Plastic last year
Arm—lower shut off switch	1	1½ oz.	High impact styrene alloy	Nu-Dell Plastics Corp.	New
Molding—evap.	1	1 lb., 6 oz.	Standard styrene	Panelyte Div. St. Regis Paper Co.	Plastic last year
Butter keeper door	1	3½ oz.	Standard styrene	Tri-State Plastic Molding Co., Inc.	New
Veg. freshener	2	2 lb., 2 oz. ea. Tot. = 4 lb. 4 oz.	Standard styrene	Kent Plastics Corp.	Plastic last year
Odds & ends basket	1	1 lb., 2 oz.	Standard styrene	Nu-Dell Plastics Corp.	Plastic last year
Slide—odds & ends basket—r. s.	1	1¼ oz.	Standard styrene	Kusan, Inc.	Plastic last year
Slide—odds & ends basket—l. s.	1	1¼ oz.	Standard styrene	Kusan, Inc.	Plastic last year
Slide—veg. fresh. center	1	4½ oz.	Standard styrene	Kusan, Inc.	Plastic last year
Slide—veg. fresh. r. s.	1	3 oz.	Standard styrene	Kusan, Inc.	Plastic last year
Slide—veg. fresh. l. s.	1	3 oz.	Standard styrene	Kusan, Inc.	Plastic last year
Ice cube pan	1	1 lb., 10½ oz.	Standard styrene	Kusan, Inc.	New
Door pan—lower	1	4 lb., 11 oz.	Paper laminated phenolic	Panelyte Div. St. Regis Paper Co.	Same as last year

Plastics Components in New Servel Automatic Ice Maker (Con't.)

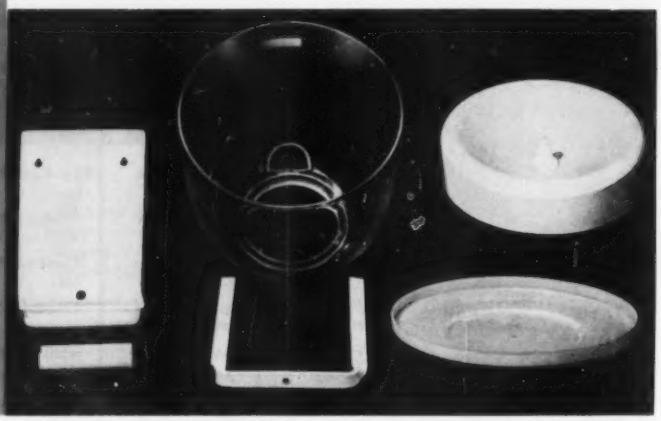
Name	*Quan*	*Wgt. per Unit*	*Material*	*Vendor*	*Part Status (New, Replaced Steel, Etc.)*
Brkt.—evap. suppt. (latch side)	1	3¼ oz.	Polyester-fibrous glass	Cortland Industries, Inc.	New (was metal)
Sleeve coupling shaft	1	1½ oz.	Reground polystyrene	Tri-State Plastic Molding Co., Inc.	New
Drip pan assy.	1	2 lb., 5 oz.	Paper pulp & synthetic resin	General Fibre Co., Inc.	Same for several years
Automatic defrost drain tube	1	3¾ oz.	Polyethylene tubing	Crescent Plastics, Inc.	New
Bumper—latch mech.	1	1 g.	Polyethylene (molded)	Tri-State Plastic Molding Co., Inc.	New
Entry tube electric wires	1	2 oz.	Vinyl extrusion	Crescent Plastics, Inc.	New
Water inlet tube auto. ice maker	1	1½ oz.	Ethyl cellulose	Crescent Plastics, Inc.	New
Handle cover	1	5¾ oz.	Acrylic	Kent Plastics Corp.	Plastic last year
Handle cover	1	5¾ oz.	Acrylic	Kent Plastics Corp.	Plastic last year
Brkt.—liner suppt.	4	5 oz. total, 1¼ oz. ea.	Polyester-fibrous glass	Cortland Industries, Inc.	New (was metal)
Door gasket —upper	1	11½ oz.	Vinyl extrusion	Geauga Industries Co., Inc.	New (was rubber)
Door gasket —lower	1	15½ oz.	Vinyl extrusion	Geauga Industries Co., Inc.	New (was rubber)
Butter tray	1	3 oz.	Standard styrene	Tri-State Plastic Molding Co., Inc.	New
Brkt.—evap.	2		Polyester-fibrous glass	Cortland Industries, Inc.	New
Front insul. housing	1	2 oz.	Ethyl cellulose	Crescent Plastics, Inc.	New
Side & bottom insul. housing	1	6¼ oz.	Ethyl cellulose	Crescent Plastics, Inc.	New
Coupling motor ejector	1	½ oz.	Phenolic cloth (laminated)	Spaulding Fibre Co., Inc.	New
Evap. brkt. hinge side	1	3¼ oz.	Polyester-fibrous glass	Cortland Industries, Inc.	New
Mtg. brkt.—striker—liner	1	3½ oz.	Polyester-fibrous glass	Cortland Industries, Inc.	New (was hi-impact Phenolic mold)
Drip guide	1	1 oz.	Cellulose acetate-butyrate	Crescent Plastics Inc.	Same as last year
Plate-light switch—upper	1	⅛ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	Same as last year
Plate-light switch—food comp.	1	⅛ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	Same as last year
Plate-heater switch	1	⅛ oz.	High impact styrene alloy	Tri-State Plastic Molding Co., Inc.	New
Spacer-evap. top	1	½ oz.	Ethyl cellulose	Crescent Plastics Inc.	New
Suppt.—I. M. mech.—front	1	2 oz.	Melamine	Cambridge Molded Plastics Co.	New
Suppt.—I. M. mech.—rear	1	4⅜ oz.	Melamine	Cambridge Molded Plastics Co.	New
Cover—I. M. therm. reset heater		⅜ oz.	Paper base laminated phenolic	Crescent Plastics, Inc., Spaulding Fibre Co., Inc., or Panelyte Div., St. Regis Paper Co. (3 vendors)	New



Courtesy John H. King Co.

Formed plastics parts, which add to the attractiveness and efficient operation of the Pelco-King juice dispenser, include . . .

. . . acrylic splash panel assembly (left) and dome (top, center), and styrene copolymer agitator (below dome) and covers (right)



FRUIT JUICE SERVED AT

TO HELP satisfy America's burgeoning taste for refrigerated orange juice and other types of fruit drinks, thousands of specially designed dispensers have blossomed out during the past few years in drug stores, restaurants, lunch counters, and similar locations.

Along with other trappings of yesteryear's more leisurely mode of living, the squeezed-to-order orange and lemon are passing out of the picture, to be largely supplanted by quick-frozen concentrates which bring the customer greater convenience as well as a drink which captures the peak flavor of the fruit. With this transition has come a demand for more attractive, more functional types of dispensers. Designers and engineers responsible for the development of these units are turning increasingly to plastics for their construction, finding in these materials the ideal answer to many of the design and operating problems involved.

A successful juice dispenser must combine a number of features. First and foremost, it must maintain the fruit juice or other type of drink at the correct temperature (approximately 38°), and keep the mixture thoroughly agitated to prevent settling out of pulp and other solids which would result in loss of flavor. The dispenser must also be convenient and foolproof in operation, as compact as possible to take as little fountain or counter space as possible, and sufficiently attractive to draw the patron's favorable attention. Durability, ease of cleaning, and simplified maintenance are other desirable factors in a juice dispenser. It must also be able to withstand contact with fruit acids and should be as light as possible to reduce shipping costs.

Choice of Materials

The three dispensers described are of particular interest because they demonstrate how various types of plastics may be used successfully and to advantage in these units.

Formed acrylic and copolymer sheet components play an important part in the handsome appearance and efficient operation of the Pelco-King fruit juice merchandiser, produced by Hugo Mfg. Co., Duluth, Minn., and distributed by John H. King Co., La Grange, Ill.

With a single exception, all the plastic parts used in the Pelco-King dispenser are formed from thermoplastic sheet materials. Fabricator of the plastic components is Regal Plastic Co., Kansas City, Mo. These parts include the front splash panel; a small table or receptacle in front of the splash panel; the bowl; the bowl cover, which is made in two parts; and the agitator. A combination of vacuum and other forming techniques is used in producing these components from Royalite and acrylic sheet materials.

In draw-forming the bowl—the largest plastic part—which measures approximately 12 in. in diameter and 2 in. deep, the male plugs used are run in at a specified rate and the vacuum, in turn, is released on an exact time schedule. Regal Plastics points out that unless this technique is followed carefully, along with precise heat control, a very high reject rate would be encountered on this large part.

Development in Forming

From the technical standpoint, the bowl, draw-formed of $\frac{3}{8}$-in. Plexiglas or Lucite, represents an

extreme development of vacuum and male plug forming. In producing this part, it is imperative to maintain a fair degree of thickness at the bottom of the bowl for adequate strength. After the piece is drawn, a ½ in. thick reinforcing ring is added to the bottom, and a reinforcing plate added at the spout hole, following which the large lower opening is made with a fly cutter and the small hole drilled. The bowl rests on a rubber gasket which provides a leak-proof seal in the final assembly.

The agitator, whose function is to keep the juice circulating in the bowl and prevent settling of pulp, is made by strip-heating a length of ¼-in. white Royalite and twisting it to the desired shape. It is secured to the metal shaft by means of an opening drilled in the top. The revolving top bowl cover, which carries an eye-catching sign, is draw-formed of white Royalite. The colorful sign itself is a large decalcomania. The small knob attached to the center of the top cover is compression molded of white Royalite pieces, with a molded-in stainless steel insert which fits the revolving shaft.

Beneath it is another disk-like cover which does not revolve, but serves primarily to close the open top of the acrylic bowl. This cover is draw-formed on a male and female type die, using ⅛ in. thick orange-colored Plexiglas. It includes a drilled center opening through which the top of the agitator shaft passes.

The front splash panel, which terminates in a shallow basin at the bottom, is of $^{3}/_{16}$-in. orange-colored Plexiglas and is also made on a male and female forming die. Three holes are drilled in this part for attachment to the front of the cabinet and for the overflow drain.

In forming the Pelco-King components, Regal makes extensive use of cast Rezolin dies, reporting that this material lends itself well to this type of tooling.

The Pelco-King juice dispenser conserves counter space and is easily serviced, since the bowl and agitator can be quickly removed.

Magnetically Driven Pump

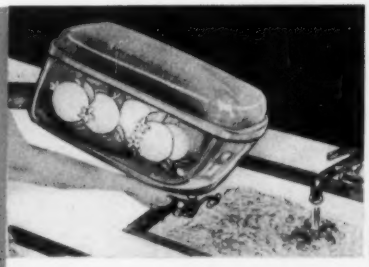
Several interesting design, construction, and operating features mark the Jet Spray cooler for refrigerated beverages, made by Jet Spray Cooler Co., Somerville, Mass. This unit incorporates a number of plastics parts, involving formed and molded acrylic, formed copolymer sheet, and molded nylon.

Styled by Samuel Ayres, Jr., As-

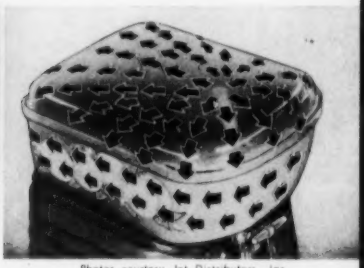
ITS BEST

Dispensers with major plastics components are attractive in appearance, sanitary, and efficient in operation

Bowl of Jet Spray is molded of acrylic; housing is formed from copolymer sheet



Lightweight, durable acrylic bowl can easily be lifted from the dispenser for periodic washings



Photos courtesy Jet Distributors, Inc.

When the Jet Spray cooler is in use, the juice is continuously recirculated

To assemble unit, the two sides of the housing are fastened together and the copolymer drip pan (foreground) is fitted over them. Bowl rests on the pan

sociates, Boston, Mass., this cooler includes the first application of a new type magnetically driven pump impeller which, despite its diminutive size and simplicity of operation, pumps 180 gal. of liquid per hour. Driven by the pump, the juice is constantly recirculated and forced out through a nozzle, impinging upon the inside surface of the clear acrylic "Strata-Dome" bowl and flowing down the inner walls, keeping the solids suspended and preventing the accumulation of pulp on the sides of the bowl as the liquid level drops.

Design-wise, the Jet Spray cooler is distinguished by its use of an elongated housing and a low, elongated tank which extends out over the drip tray. According to the designer, this tank not only has less tendency to block the view when the unit is installed on drug store soda fountains and other locations, but also affords more dramatic application of the featured jet spray action, with the liquid cascading down the sides of the tank and the cover designed to "umbrella" the spraying liquid. The low look of the dispenser (it stands only 22 in. high) is accentuated by use of full-length horizontal louvers on each side of the housing, formed of copolymer sheet material. The louvers provide adequate ventilation for the refrigerating mechanism and also strengthen the panels.

The designers have this to say about the selection of plastics for the tank and all housing panels of the cooler:

"Plexiglas was chosen for the tank and cover because it is transparent, break-resistant, and light in weight. The latter two reasons were quite important, since the tank must be periodically removed and washed out. For the chassis housing and tank drip pan, Boltaron was the choice. Here durability; color permanence; proof against denting, chipping, and staining; and freedom from metallic vibration were deciding factors, in addition to Boltaron's suitability to molding by vacuum techniques."

Typifying the functional use of plastics in this dispenser is the specification of a molded clear Lucite housing for the magnetically propelled pump, the impeller of which consists of an Alnico V rotor magnet, completely imbedded in molded nylon and free to turn on a stainless steel shaft.

When power is applied to the 1/60-hp. driving motor, the impeller revolves along with the horseshoe magnet fastened to the motor shaft. Liquid is then sucked in and forced out through the pressure outlet. With the control valve in the closed position, the liquid passes up through the spray tube and out against the top and sides of the bowl. When the valve is opened by slight pressure on the Lucite valve handle, the liquid is pumped out through the valve and into the glass, and aerated as it is delivered. Because of the use of pressure rather than gravity feed, the dispenser can fill a 4-oz. cup in one second.

Easy to Clean

The Jet Spray cooler is particularly easy to clean, since there are no agitator paddles, clutches, or similar parts involved. The entire bowl may be easily lifted off for washing. The stain-resistant, chip-proof Boltaron cabinet is cleaned simply by wiping it with a damp cloth. A pioneering feature is the use of a Westinghouse Odorout Sterilamp which provides maximum sanitation to the tip of the tap and safeguards the interior of the cabinet against bacterial growth, mold, and contamination.

Gregstrom Corp., Cambridge 39, Mass., produces the fabricated thermoplastic parts which are used in the Jet Spray cooler. This company made the preliminary model of the unit and engineered the production tooling. Three of the parts are fabricated of Plexiglas; the remaining three, of Boltaron 6100 copolymer sheeting.

The acrylic pieces form the Strata-Dome bowl and its insulating type cover. Made from ¼-in. sheet stock, the bowl is formed by the plug-and-ring technique in an air-operated press of Gregstrom's own design. The piece is trimmed and the necessary holes for cooling turret, jet tube valve, and spigot cut out by the Gorton pantograph process to insure accuracy. The other two acrylic pieces, of ⅛-in. stock, are formed by the same method and cemented together to form an insulating dead air space. Bowl and cover have interlocking flange-type edges which provide a leak-free fit.

Courtesy Ebco Mfg. Co.

Ebco Oasis dispenser has a sturdy, colorful base molded of fibrous glass laminate

The three copolymer sheet pieces made by Gregstrom make up the sides and top of the housing which encloses the refrigerating unit and on which the bowl rests. The ⅛-in. thick drip tray, or top section, is vacuum formed in one of the company's specially designed vacuum machines. The two sides of the housing were formed by a plug-and-clamp method, with vacuum utilized to form the ventilating louvers. Special trim jigs were designed to cut and rout these pieces to shape. All assembly of the formed thermoplastics sections and parts is handled by Jet Spray Cooler Co.

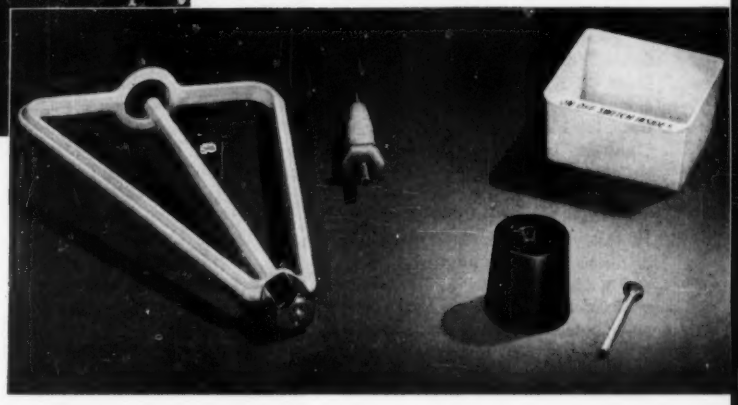
Reinforced Plastic Base

Still another combination of plastics components is found in the Oasis juice dispenser, made by Ebco Mfg. Co., Columbus, Ohio. Plastics utilized in the Oasis unit include molded nylon, molded acrylic, molded styrene copolymer, molded butyrate, and polyester-glass laminate.

The sturdy base or cabinet of the Oasis dispenser, of one-piece construction, is molded of fibrous glass laminate by Structurlite Plastics Corp., Hebron, Ohio. This component and the drip tray, forming the top of the cabinet, are produced by the preforming process and molded

Courtesy Chicago Molded Products Corp.

Clear acrylic bowl for the Ebco dispenser is removed by operator from a 64-oz. vertical injection machine



Other plastics parts are (top row, left to right) copolymer agitator and nylon bearing and drip drawer. Phenolic feet (one shown in foreground) are optional

with matched metal dies. Selectron resin is used.

The ventilating louvers in the side of the cabinet and the opening for the small removable drawer into which the overflow drains are punched after molding. Since the cabinet is supplied in a choice of four standard colors—white, gray, blue, or green—the laminated parts are painted with a baked enamel type finish. The reinforced plastic cabinet is non-breakable, non-porous, non-absorbent and non-corroding—an ideal combination for the type of service it must deliver in the field.

The clear acrylic bowl, measuring approximately 12 by 12 by 10 in. deep, weighs 52 oz., exclusive of cover, and is produced by Chicago Molded Products Corp., Chicago, Ill. The removable lid or cover for the bowl, for which cellulose acetate butyrate was specified because of its durability, is molded by American Insulator Co., New Freedom, Pa.

Copolymer Agitator

The bowl of the Ebco cooler has a nominal capacity of 4 gal. and will hold up to 5 gal. of beverage. Tough and mar-resistant, it washes easily in warm water. According to the manufacturer, the exclusive square design of the bowl keeps juice and pulp perfectly mixed at all times. Currents set up by the Kralastic styrene copolymer agitator strike against the sides and corners, creating a surging and eddying action.

The white copolymer agitator of this dispenser, which revolves constantly while the unit is in operation, is molded by Aico. It resists breakage, will not discolor, and lifts easily from the drive shaft for thorough cleaning.

Optionally available in locations where sanitary regulations so require, are four plastic feet which fasten to the cabinet by means of screws. They are molded of black modified styrene by A & Z Engineering, Covington, Ky.

The current Ebco model has two parts molded of nylon. One is the drip drawer into which overflow is directed. Produced by Cambridge Molded Plastics Co., Cambridge, Ohio, the drawer is made of nylon so that it can withstand the application of a baked enamel finish to match the colors used on the cabinets.

The other molded nylon part which does not show from the outside of the dispenser, is the agitator drive shaft bearing assembly. Here a material was needed which would combine good thermal insulating properties and bearing characteristics; nylon filled the bill perfectly.

Plastics Pay Off

These three dispensers, selected from many to show the wide variety of plastics used in such applications, prove that plastics can pay off under the grind of day-after-day use. They not only resist exposure to fruit acids, but they go through each day with a bright, clean, sanitary appearance that helps to sell the product they dispense.

THE PLASTICS ERA IN AIRCRAFT

Part Two of a "Panel in Print"

Courtesy The Glenn L. Martin Co.

New plastics and new plastics techniques are finding their places in rocketry

THIS is the second of a series of three groups of three articles each, the nine articles constituting a "panel in print" based on the forum presentation of the Pacific Coast S.P.I. Conference this year.

Moderator Carl R. Lemons, Plastics Engineer, Douglas Aircraft Company, Inc., herewith introduces the second group of panel members:

• • •

AMONG the more romantic and widely discussed types of plastics materials currently used in aircraft and guided missiles are the fibrous glass laminate constructions. Principally because of their high physical strength these laminates are being considered seriously in structural components such as wings, control fins, fuselage, and empennage sections, as well as in pressure vessels for oxygen and fuel. All these are steps toward maximum use of plastics in aircraft and missiles.

In most of these applications the laminate is required to operate under stress at relatively high temperatures, as high as 500° F. continuously and up to 1000° F. for short durations; which is surprising since the resin binder is an organic chemical compound.

The missiles field alone is capable of consuming a staggering volume of structural plastics. The surface has not yet been scratched. The deterrent factors in these applications, as in high-speed aircraft, have been not only the loss in strength of the laminate at elevated temperatures but also the difficulties encountered in designing around the basic deficiencies, among which the low ductility (inducing a sensitivity-to-stress concentration), low modulus of elasticity, and low interlaminar bond strength are of prime concern.

Once the problems resulting from these deficiencies are solved, we can reap the many advantages which existing applications have allowed us to realize such as: a) smooth, continuous molded airfoil surfaces; b) ease of fabrication, allowing large, complex, and integrally molded components; and c) corrosion resistance. Jess Steinman, Hughes Aircraft Co., and D. M. Hatch, Jr., Hughes Research Laboratories, discuss the detailed requirements and design criteria for efficient plastics components in missiles.

In coordination with laboratory test data, it is realized that the strength of these laminates at elevated temperatures may depend to a large degree upon the techniques used in the manufacturing processes. Max Nadler, North American Aviation, has found and classified several processing variables affecting the elevated temperature properties and explains the problems of duplicating the strength of laboratory test specimens in production of airborne components.

A relatively new and interesting application added to the already impressive field is presented by Dr. Marvin H. Gold, Aerojet-General Corp., who discusses rocket and missile motor designs and their relation to the plastics industry.

One of the most reliable indications that plastics have today a substantial place in the aircraft and missiles industry is the appreciable sums of time, energy, and money allotted to the development of currently designed plastics components.

Members of the Second Panel on Plastics in Aircraft

LAMINATING METHODS
D. M. Hatch, Jr.
Hughes Research Laboratories

PRIMARY STRUCTURES
Jesse Steinman
Hughes Aircraft Co.

ROCKET MOTORS
M. A. Nadler
North American Aviation, Inc.

MISSILE MOTORS
Marvin H. Gold
Aerojet-General Corp.

Since the introduction of fibrous glass laminates in 1943, the aircraft plastics engineer has continually been hampered by the lack of adequate design data and insufficient applications on the design boards to justify exhaustive research programs to obtain design data comparable to that available for metals.

The accumulation of design data is a project of the Committee of Reinforced Plastics Section of the S.P.I., and the cooperation of aeronautical engineers and aerodynamicists will bring the data amassed to an early point of usefulness.

Plastics in Primary Structures

by D. M. Hatch, Jr., and J. Steinman

PRELIMINARY tests conducted several years ago indicated that the newer heat-resistant phenolic-glass fabric laminates in many instances could replace aluminum and magnesium for use as primary structural members.

It became apparent very early in our design comparisons that insufficient data for the laminates were available. In order to insure the design of economical, efficient, and adequate structures it became necessary to conduct an extensive series of various tests, experiments, and analyses.

The following partial outline will indicate the scope of this task:

1) Photoelastic determination of stress concentration factors for various shapes and sizes of cutouts in curved panels.

2) Experimental verification, using full scale models, of item 1.

3) Mechanical properties versus temperature.

4) Buckling data, for various shapes, versus temperature.

5) Thermal properties.

6) Effect of aging and weathering on mechanical properties.

7) Development of equations to determine thermal shock.

8) Data necessary to perform vibration calculations.

9) Endurance limit.

10) Data necessary to predict failure under combined loads.

11) Optimum size and type of doublers necessary to prevent local crippling.

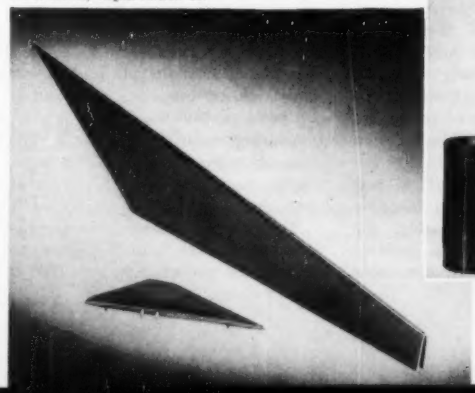
In addition, many other routine tests have been conducted. One factor that hampered the course of our experiments was the lack of standard equipment necessary for conducting these tests at elevated temperatures.

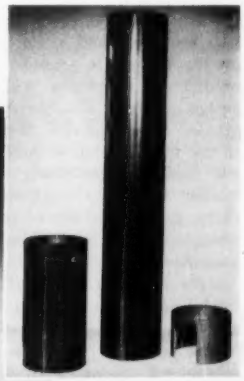
For example, to simulate operating conditions of some parts it was necessary to raise the temperature of the test specimen several hundred degrees in a few seconds and to simultaneously record time, temperature, and strain.

Another problem requiring a so-

Figs. 1 and 2—Examples of aircraft components of a primary structural nature, developed as a result of close cooperation between the aircraft and the plastics industries. For further discussion, see the text on page 188

Photos courtesy Hughes Aircraft Co.





lution was that of loading test specimens at high temperatures very rapidly and accurately without the introduction of dynamic effects.

Concurrently with the evaluation of physical properties, an extensive study was undertaken to develop the required fabrication techniques and tooling. This was necessary in order to produce structural parts which exhibited maintenance of close tolerances, uniform quality, ease and economy of production, and reproducibility of physical properties. Since our products in al-

(*Continued on p. 188*)

Heat Resistant Laminates

by M. A. Nadler

THE Aerophysics Dept. of North American Aviation has been interested for some time in the use of elevated temperature-resistant reinforced plastics for primary structural applications, and has engaged in extensive research and development in this field for the past 1½ years.

These various structures under consideration include such items as stabilizers, air ducts, and integral fuel tanks in addition to parts conventionally manufactured from glass reinforced resins.

Individual parts under consideration may weigh several hundred pounds. Total poundage of primary glass reinforced plastics may attain a figure of about 40% of structural weight of ship or about 2½ tons per ship, providing all problems of performance, manufacture, and cost lend themselves to a satisfactory solution.

Attention soon focused on a commercial phenolic resin, for reasons of availability in commercial quantities and superior elevated temperature mechanical properties of glass fabric laminates prepared with this resin.

Since the parts under consideration are large and since prototype production was to precede eventual production quantities with major design changes anticipated, it was decided to devote the largest part of the investigation to manufacturing methods combining low-cost tooling and only moderate pressures, and to a study of properties which might be attainable by such procedures.

Very early in the work it was established that adequate bleeding must be maintained during the curing cycle in order to prevent subsequent blistering of laminates on exposure to elevated temperatures. A satisfactory vacuum-bag technique was worked out. Large, thick panels have been prepared, and no blistering troubles have been encountered since inception of the method devised.

The highest average flexural values recorded on vacuum bag 181 glass cloth laminate panels at 500° F. after ½ hr. exposure at that temperature were 62,000 p.s.i. for strength and 4,220,000 p.s.i. for elastic modulus. In order not to be misleading, it is pointed out that these values were obtained on different panels and are associated with lower, although still respectable values. The best combinations obtained were 56,200 and 3,400,000 p.s.i., and 60,300 and 3,020,000 p.s.i., respectively.

However, reproducibility of the high values has been poor. Analysis of data obtained showed that consistently high laminate mechanical properties, particularly elastic moduli, had been only obtained from certain rolls of impregnated fabrics. These rolls did not differ significantly from other identically marked material with respect to normally measured properties such as percent resin pick-up, percent volatiles, and flow. It was found that it is desirable to have a high degree of polymerization, i.e., the impregnant should be pretty far advanced.

Attempts to obtain the desired degree of polymerization on impregnated cloth which is not sufficiently advanced, by drying it prior to lay-up, have only been partially successful, since attaining the desired polymerization range often also has the undesirable effect of losing the desired flow. It is our general opinion that properties of impregnated cloth must be controlled at the source, that is, by the resin manufacturer and impregnator. It cannot be left to the laminator to adjust incoming material to the desired properties.

It is hoped that the N.A.A. experiences related here will serve to point up that the insistence of aircraft industry plastics engineers on raw material quality control is not unreasonably whimsy. Such control will enable fabricators to produce uniformly good parts and will enable engineers to use low safety factors in design. This will make the use of plastics much more attractive for many applications; in fact, it will dictate their usage in preference to competitive materials in many cases.

Motors for Rockets and Missiles

by Marvin H. Gold

ROCKETS and guided missiles are complex machines which consist essentially of the motor unit, guidance section, and the warhead. Any rocket will contain the motor unit and may or may not have either or both of the auxiliary features, depending upon its end use. In this discussion we will confine our comments to applications in the motor unit, exclusive of the propellant.

The greatest potential use for reinforced plastics is in the construction of the rocket chamber. This is the pressure vessel which contains the burning rocket propellant.

The main reason that reinforced plastics are not used for the purpose of rocket chamber construction lies in the limitation of the material itself. The reduction in weight that might be realized from the use of a plastic chamber is as attractive to the rocket designer as it is to the aircraft designer. Aside from the high cost and the expensive fabrication techniques, both of which

(*Continued on p. 189*)

NEWS AND VIEWS OF PLASTICS PROGRESS

STOKES plastics review

VOL. 2
NO. 3
1953

PUBLISHED BY F. J. STOKES MACHINE COMPANY, PHILADELPHIA 20, PA.

Core Dryers for Precision Metal Casting are now Produced by Plastics Molding

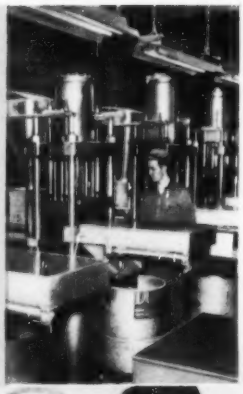
Plastic compound has replaced aluminum in the development of a new type of core dryer for foundries which use dielectric ovens for high production jobs. These core dryers can be produced more cheaply, and at a faster rate, than the old-style aluminum core dryer. Formed Plastics, Toledo, Ohio, is the firm which has come up with this new idea . . . and it's paying off in lower production and materials costs.

Approximately 12 plastic core dryers an hour are produced by Formed Plastics on a Stokes Model 726, semi-automatic, 200-ton compression molding press. Other plastic products are also made on the same press, which is specifically designed to mold relatively deep draw parts. Its ram speed is the highest among standard model presses.

Closeup of two plastic core dryers made on the Stokes press at Formed Plastics. Back of dryer is shown at left, front of dryer at right.

Operator examines a plastic core dryer after removal from the Stokes Model 726 compression molding press at Formed Plastics, Toledo, Ohio.

"We are Producing Molded Electronic Parts of a Difficult Nature..."



Operator checks a battery of four Stokes Model 741 fully automatic plastics molding presses at the Philadelphia, Pa., plant of Hugh H. Eby, Inc. Only occasional spot checks of the presses are required; parts are automatically ejected from the presses.

Examples of various types of radio, television, and electronic parts made on Stokes Model 741 presses at Hugh H. Eby, Inc.

"Our work requires the finest molds and molding equipment of a high precision nature to produce large quantities at a minimum of cost," reports a spokesman for Hugh H. Eby, Inc., Philadelphia, Pa., manufacturers of radio, electrical and communication components. "Stokes presses fulfill this requirement in every respect."

Tube bases, sockets, plugs, and connectors are all produced on a battery of eight Stokes Model 741 fully automatic plastics molding presses at Hugh H. Eby, Inc. They are then combined with the firm's own sheet metal stampings. In addition, Eby also uses a battery of Stokes semi-automatic compression and transfer molding presses and Stokes Model R preforming presses to produce other wiring device components, especially for the electronics field.

Recently, Hugh H. Eby, Inc. purchased the new Stokes Model 800 plastics molding press for fast, efficient production of smaller tube sockets.

Michigan Molded Plastics is Equipped to Handle Both Automatic and Semi-Automatic Molding

Operator removes a set of finished parts from one of the Stokes Model 727 transfer molding presses at Michigan Molded Plastics, Inc., Dexter, Michigan. The press is designed to accommodate top as well as bottom ejection molds; its ram speed is the highest among standard model presses.

Michigan Molded Plastics, Inc., Dexter, Michigan, a long established custom molder, formerly operating exclusively on the accumulator system, is now expanding with Stokes automatic and semi-automatic self-contained units. A widely diversified line of molded plastic parts is in production. Products turned out at Michigan Molded Plastics vary from plastic parts for fishing reels to large switch cases for the U.S. Navy. As many as 75 parts are in production at one time, each type of part being produced according to the molding process best suited to its particular design.

Altogether, Michigan Molded Plastics is using four Stokes plastics molding presses. They are: two Model 727, 200-ton semi-automatic transfer molding presses; one Model 741-A, 50-ton fully automatic press; and one Model 235-A, 50 ton fully automatic press. The Model 727 press has proved to be ideally suited for molding relatively deep draw parts. Smaller pieces can be produced on the same press, however, without any sacrifice in flexibility. Flexible control and hydraulic circuits permit quick change-over from compression to transfer molding.

The Stokes Model 741-A fully automatic press at Michigan Molded Plastics is adapted to producing a wide variety of uniform, identical parts. Many parts not previously considered suited to fully automatic production are made on this highly versatile press. The fully automatic press is used wherever possible since it provides the cheapest means of producing parts which are suitable for automatic production. It can be cycle-operated for insert work or other special operations, and manually operated during the setting-up period.

The Stokes Model 235-A press at Michigan Molded Plastics can be run as a fully automatic press, as a semi-automatic for insert work, or manually operated by push-button control.

Outstanding Compounding and Coloring Results Obtained on Stokes-Windsor Extruder and New Pelletizing Unit

A new auxiliary Pelletizing Unit is now available for the Stokes-Windsor Extruder which performs three primary functions:

(1) Compounds, colors and pelletizes many thermoplastics, such as elastomeric vinyls, polystyrene, polyethylene and cellulose acetate;

(2) Compounds, colors and pelletizes reclaimed scrap plastic for injection molding;

(3) Compounds and colors virgin materials for injection molding, thus reducing the need for large inventories of colored material.

Shown above is the Model RC-100 Stokes-Windsor Extruder with auxiliary Pelletizing Unit, consisting of 15-cavity die, cooling tank, air-jets for water blow-off, and a variable-speed puller and cutter.

Recent runs have resulted in actual production rates of 170 pounds per hour on the compounding and coloring of polystyrene material on a Model RC-100 Stokes-Windsor Extruder utilizing the new Pelletizing Unit. Nominal capacity on this machine is 100 pounds per hour. These rates take on added significance in view of the fact that a screen pack employing 180-mesh screen was used for this critical dispersion job.

The positive discharge of this twin-screw extruder, with complete absence of pulsation, also creates pellets of uniform size and density.

Operation of the Stokes-Windsor Extruder with the Pelletizing Unit is extremely simple. The operator merely fills the hopper with material; the machine then takes over the entire job of extruding plastic strands from the die. The strands emerge in $\frac{3}{16}$" square sections, which are reduced to $\frac{1}{8}$" by the action of pulling-rolls. As the plastic strands emerge from the die, they dip at once into a cooling-tank. After cooling, the strands pass over crosswise air-jets to remove all moisture and then on through pulling-rolls to a cutter.

Arrangements for a demonstration of the Model RC-100 Stokes-Windsor Extruder with Pelletizing Unit in operation can be made through the Stokes District Office in your area or by writing directly to the Stokes Philadelphia Office.

Vacuum Metallizing Increases Sales Appeal of A. C. Gilbert's American Flyer Trains

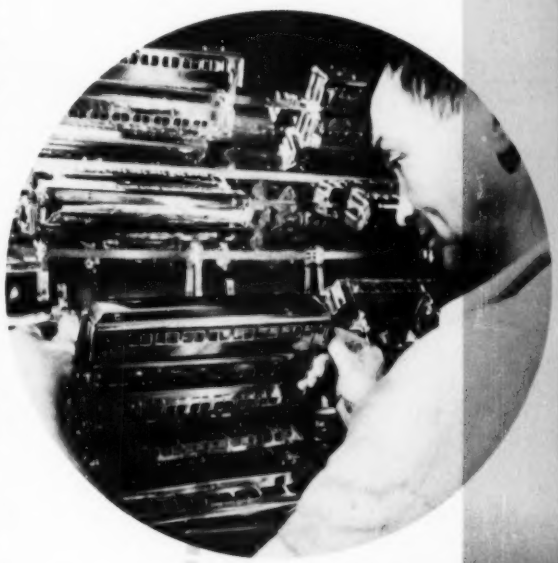
In June, 1952, The A. C. Gilbert Co., New Haven, Conn., began applying a bright aluminum coating to its American Flyer line of scale model trains in a Stokes Model 426 vacuum metallizing unit. Prior to that time Gilbert train locomotives and car bodies were spray-painted with aluminum, a process which proved to be unsatisfactory from a sales standpoint; or fabricated from extruded aluminum, which proved too costly. The firm also experimented with silver nitrate, resulting in "poor production from this process." Vacuum metallizing, on the other hand, has resulted in the creation of a vastly superior product . . . one which is enjoying far greater sales appeal . . . at no increase in cost!

Production has increased since vacuum metallizing was instituted at The A. C. Gilbert Co. Depending upon the size of units processed, between 3600 and 7200 units are metallized each 8-hour day. Made from black plastic composition, the miniature railroad cars and locomotives are first sprayed with an undercoat of clear lacquer to provide a smooth base for the metallized film. The coating is then baked at 130° F., after which the units are arranged on revolving fixtures and loaded into the vacuum chamber on a removable frame. Low-cost aluminum staples, attached to tungsten filaments to facilitate melting, are included on the frame.

A vacuum is drawn in the Stokes chamber to 0.5 microns, absolute, by two Stokes high-speed diffusion pumps. Current heats the filaments, melting the aluminum staples and "wetting" the strands of tungsten from which they are supported. A further boost of current vaporizes the aluminum, which is deposited, 3 to 5 millionths of an inch thick, on the locomotives and cars. A lacquer finish is applied for added protection; no buffing or other hand finishing is needed.

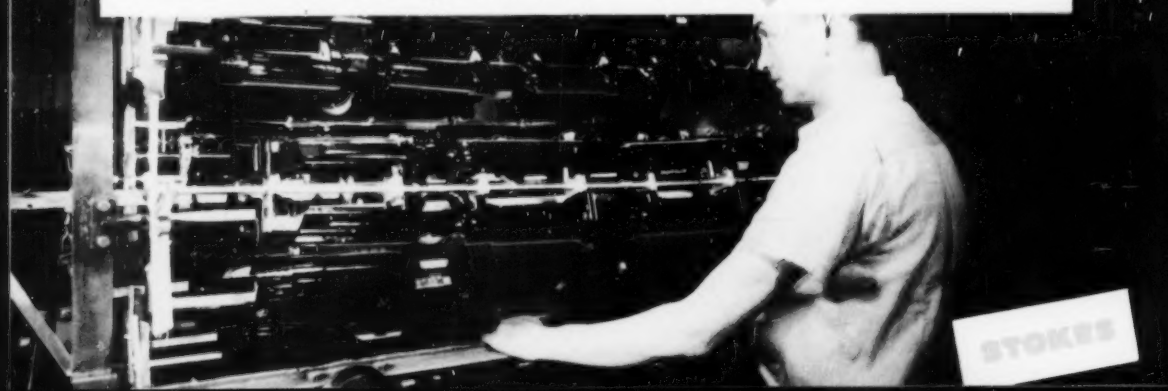
The A. C. Gilbert Co. began manufacturing scale model railroad train cars and locomotives in 1938. The firm works in close cooperation with such builders of full-scale trains as Baldwin and American Locomotive, to insure accuracy-to-detail of Gilbert's American Flyer model trains.

Before-and-after view of scale model "Comet" diesel locomotive made at A. C. Gilbert Co., showing unmetallized black plastic composition unit at top and metallized unit at bottom.



Scale model train cars are rolled out of the Stokes vacuum chamber after metallizing has applied a brilliant lustre to each car.

Operator rolls black plastic composition scale model locomotives into Stokes Model 426 vacuum metallizing unit at The A. C. Gilbert Co., New Haven, Conn.



Closeup showing ¾" polyethylene pipe being extruded from the Stokes-Windsor Extruder at Yardley Plastics Co. in 400-foot coils. Water jets cool the pipe as it is extruded. Output is maintained at 100 pounds or more per hour.

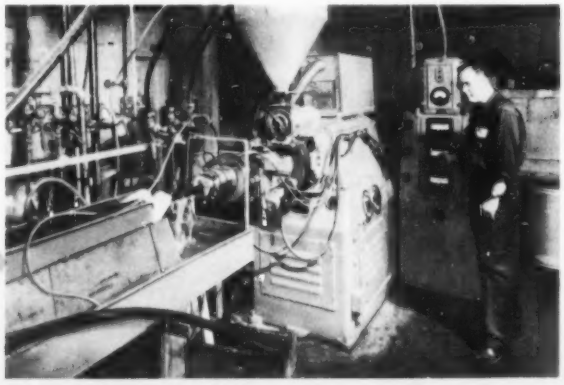
"We Like the Fast, Positive Output . . . Uniformity of Product and Versatility We are Getting on our Stokes-Windsor Extruder"

Those are the words of Howard Wilson, Plant Superintendent at Yardley Plastics Co., Columbus, Ohio, in reporting on the performance of the firm's Stokes-Windsor twin-screw extruder, Model RC-100. Yardley, one of the top plastics extruders in the country, is well-known for its "Clearstream" flexible plastic gas and water pipe, its G/P rigid pipe, and its plastic pipe fittings. Many of its extruded products must meet rigid tolerances for inclusion in other precision-made products.

Complete lack of pulsation in the Stokes-Windsor Extruder at Yardley Plastics Co. has resulted in fast, highly controlled, positive outputs. Size of output can be controlled to absolute uniformity, whether it be butyrate tube with a $\frac{7}{8}$" outside diameter or polyethylene pipe with $1\frac{1}{2}$" outside diameter. Outputs on the Stokes-Windsor Extruder at Yardley vary from 80 pounds per hour on butyrate to 100 pounds per hour on polyethylene. Outputs on some vinyls have run as high as 110 pounds per hour. Nominal capacity is 100 pounds per hour.

Another feature of the Stokes-Windsor Extruder proving to be highly useful to Yardley is the machine's versatility, which has allowed the switch from vinyls to polyethylene, or from butyrate to cellulose acetate, without any interruption in production schedules.

Polyethylene pipe is one of the principal plastic products being made on the Stokes-Windsor Extruder at Yardley Plastics Co. Included is pipe, in 400-foot coils, for jet well installation, pipe for drinking water installation, and pipe for farm use. Yardley also uses its Stokes-Windsor Extruder to convert elastomeric vinyl into such items as gaskets for storm windows, garden hose, and porcelainized steel gas station gasketing.



Operator checks the Model RC-100 Stokes-Windsor Extruder in operation at Yardley Plastics Co., Columbus, Ohio. Polyethylene water pipe is shown being extruded in ¾" diameter, .115" thickness.

STOKES

F. J. STOKES MACHINE COMPANY
5534 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment

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ANTI-STATIC BRUSH

Bristles remove dust; radioactive material housed safely in urea handle

neutralizes surface charge and prevents further attraction of dust

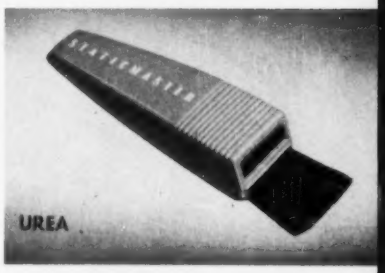
SWITCHING from wood and steel to plastics in the construction of an anti-static brush has not only enhanced the appearance of the piece but has simplified its assembly and reduced the cost of its production.

The brush, a product of Nuclear Products Co., El Monte, Calif., is used to remove static-attracted dust and lint from photographic negatives and photographic records. Polonium, a radioactive material stored in the handle of the brush, neutralizes the static electric charge that develops on such surfaces when they are handled; hence, after a surface has been stroked with the brush, no additional dust or lint will be attracted to it.

Before the changeover to plastics, the wooden handle, steel housing, and various other steel parts of the old model were assembled into a finished unit by being screwed together or welded on.

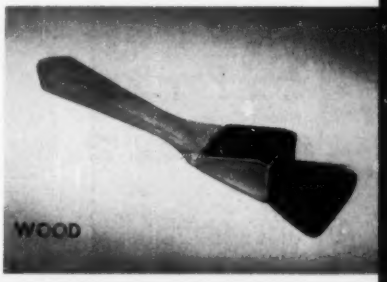
By using plastics, Henry Keck Assoc., Pasadena, Calif., designers of the new brush, reduced the assembly time required for the wood-steel model by 75% and eliminated ⅓ of the parts. The basic part of the new anti-static brush is the all-plastic handle, consisting of two molded sections screwed together. Nichols Plastic and Engineering Co., Los Angeles, Calif., molds both halves, using a specially formulated urea developed and supplied by American Cyanamid Co. The job is done in a 16-cavity die in a vertical transfer molding press.

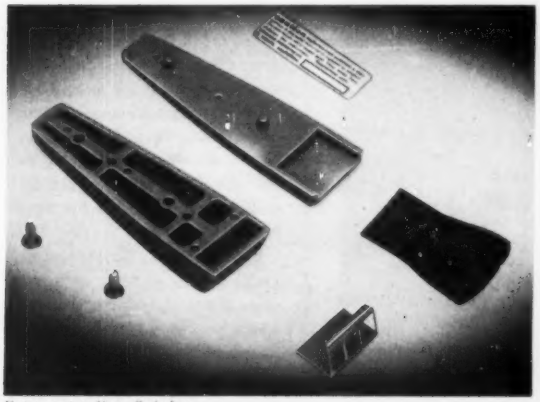
The first step in the assembly of the new model is cementing the brush bristles directly into a molded-in slot in one half of the handle and placing an L-shaped protective steel screen, behind which the dangerous-to-touch radioactive material is stored, in a molded recess in the other half. The two halves are then assembled by self-tapping screws in holes in a recess molded-in the rear surface of the brush. Finally, a label is cemented into the recess over the screws. Since the top of this permanent label is flush with the rear surface of the handle, the unit cannot be easily taken apart.



Molded urea handle of new anti-static brush is designed to simplify assembly operations

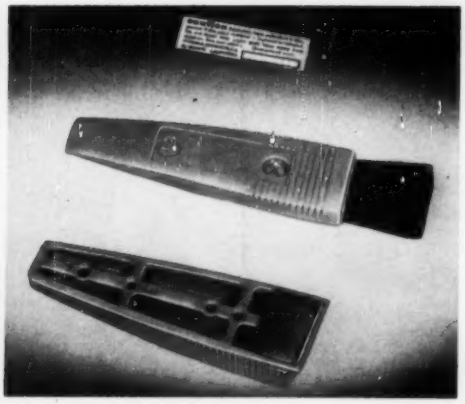
Wooden-handled model—before changeover to plastics—used costly welded-on metal parts





Photos courtesy Henry Keck Assoc.

Basic parts of new brush are top (to right of screws) and bottom (below label) halves of urea handle, bristles, and steel screen (foreground)



Halves of handle, with bristles and screen secured in place, are screwed together; label is cemented into molded-on recess over screws

Defense Dept. photo

BATTLE ARMOR UP-TO-DATE

Two types of vests and a groin protector, using reinforced plastics and nylon, greatly reduce the incidence of wounds in action

Marine Corps combat body armor, made up of polyester-glass plates in nylon cover, withstands point-blank fire from .45 caliber submachine gun

Only a skin bruise was suffered by this infantryman when he was struck by grenade fragments. The fragments were stopped by nylon armor vest which the soldier was wearing

U. S. Army photo

The plastics industry has contributed much to the efficiency of a war machine that is designed to kill. It is, therefore, with great pride for plastics that we can now present the story of a plastics product designed to save lives rather than kill men in battle. We offer body armor as the most worthwhile plastics product ever produced for warfare.

The Army Quartermaster Corps is also working on many other plastics products, some of which have been previously mentioned in MODERN PLASTICS. A summary of what is happening to a few representative items is included in this article.

THERE have been many sensational plastics products manufactured since Hyatt first developed a cellulose nitrate billiard ball, but certainly a candidate for the rank of most sensational of all is the body armor now being used by soldiers and marines in Korea.

Plastic body armor will provide maximum protection against missiles that account for three-fourths of all combat casualties. Experience to date has proved that they will lower the incidence of torso wounds by over 60 percent. Even when the armor is penetrated by a missile, severity of the wound is reduced by 25 to 30 percent.

Armor vests are not expected to stop high-powered rifle or machine gun bullets, but they do offer protection against low velocity shell, mortar, and grenade fragments which cause by far the largest number of combat casualties.

Two Types of Armor

There are two types of armor vests now employed in the services —the Marine version, using reinforced plastics, and the Army type which depends upon layers of nylon duck for resistance to penetration. The Marine Corps armor vest has been mentioned previously in this magazine. (See MODERN PLASTICS Bulletin, April 1952, and the Plastiscope, August 1952, p. 188). Basically, the vest is made up of 5¼-in. square pieces of high pressure polyester-glass laminate with a nylon duck covering. The plastic-glass inserts are molded with a concave inner surface and are lapped over each other, somewhat after the manner of fish scales, to provide flexibility. The vest fits with almost the snugness and comfort of a sweater and gives excellent freedom of movement. The weight is about 8 pounds. In addition to the protection it offers from missiles, it is also strong enough to ward off bayonet thrusts.

The Marine Corps plastic-glass vests were first used experimentally at Okinawa during World War II, but the present version has been vastly improved. The First Marine Corps Division has been using them in Korea in actual combat and on raiding parties for over a year. Continental-Diamond Fibre Co., Newark, Del., and Plywood-Plastics Corp., a subsidiary of Westinghouse located in Hampton, S.C., manufacture the plastic-glass plates and furnish them to fabricators of the vest. The armor is called Doran in honor of Gen. Georges F. Doriot, formerly in charge of Research and Development for the Army Quartermaster Corps, who played a prominent part in its early stages of development.

Armor vests are flexible, comfortable, do not hinder movements of either this wireman or his guard in their grim work

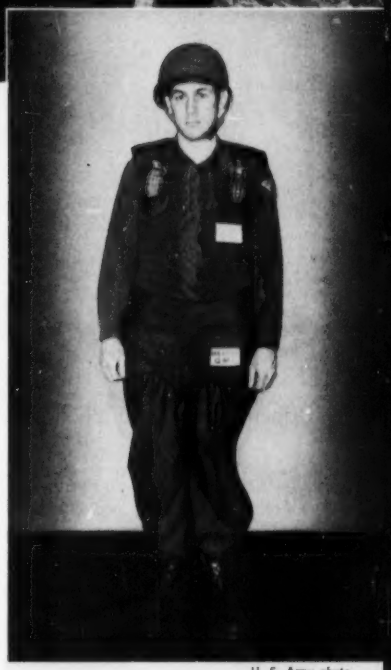
According to British newspapers, an English firm is seeking a license to manufacture a similar vest for use by United Kingdom Armed Forces.

Testing and development work on the second type of armor vest, by the Army Quartermaster Corps., has been completed only recently. While there has been much too much argument over which is the better, the significant fact is that both types of body armor do a sensational job of saving lives.

Early Model

The daddy of the Quartermaster Corps' nylon body armor was the flak suit worn by naval airmen in the latter part of World War II and described in the August 1945 issue of MODERN PLASTICS. But many refinements and improvements have been made since then. The present armor will stop shell, grenade, and mortar fragments; is at least par-

(*Continued on page* 182)



U. S. Army photo

Above: Nylon armor vest and lower torso armor, developed by the Army Quartermaster Corps. The vest and the lower torso or groin armor (close-up below) weigh total of only 12 pounds

U. S. Army photo

Industrial washbasin, designed to accommodate several employees simultaneously, is fitted with a molded phenolic soap dispenser just above the sprayhead. The plastic dispenser offers major improvements in styling and working features over the brass unit it replaces

Photos courtesy Bradley Washfountain Co.

Soap in a Hurry

Dispenser molded of phenolic replaces brass unit, can hold two types of soap

WHEN noon hour or quitting time rolls around in an industrial plant, dozens of workers want to wash up at the same time. Rather than install a large number of individual lavatories, which would take up excessive floor space, many modern plants meet this problem with one or more washfountains. Equipped with a foot control valve with which the warm water spray can be turned on from any point around the perimeter of the circular basin, these units keep lost time to a minimum by enabling as many as six or eight employees to wash up simultaneously.

Recently Bradley Washfountain Co., Milwaukee, Wis., a leading manufacturer of this type of equipment, made a major improvement in the soap dispenser which fits on the top of each fountain, just above the sprayhead. The dispenser, which had formerly been made of chrome plated brass, was changed to one of molded phenolic construction and a modified design was adopted. Although originally the scarcity of brass was largely responsible for company's decision to make this change, it was found possible in the conversion process to incorporate a number of features not present in the metal unit.

Old and New

With the original metal dispenser, a separate supporting tube was required at the bottom; this is now molded as an integral part of the improved dispenser and a separate tube is no longer required. Through this change, the need for a gasket-and-assembly operation at this point was eliminated, along with any possibility of leakage.

Since the former metal-dome-style dispenser consisted of one undivided chamber, it could dispense only one form of soap—either powdered or liquid. The new plastic dispenser, designed in two self-contained halves which can be used individually or as a complete circular unit, can be fitted with different types of valves in each half if desired—push-type liquid soap valves on one side and side-swing type powdered soap valves on the other. The new design provides a total of four soap valves, whereas the earlier model had only three.

When the soap dispenser was first changed to one constructed of black molded phenolic material, provision was made for filling the unit with soap by opening the crescent-shaped lid pieces. It was felt, however, that this arrangement was not sufficiently convenient. As a result, the design of the lids was slightly

modified to include 2-in. openings through which powdered or liquid soap could be easily introduced.

These openings are provided with circular filler caps molded of the same material, equipped with spring steel clips which hold them firmly in place. When rotated to the proper position, the clips line up with notches molded in the lid openings to permit removal of the filler caps.

Another problem encountered was the tendency of certain types of liquid soaps to soften the plastic material. This difficulty was overcome through the use of Durez 13856, a flock-filled agitator type material characterized by high impact resistance, low water absorption, and resistance to chemical attack.

Six Molded Parts

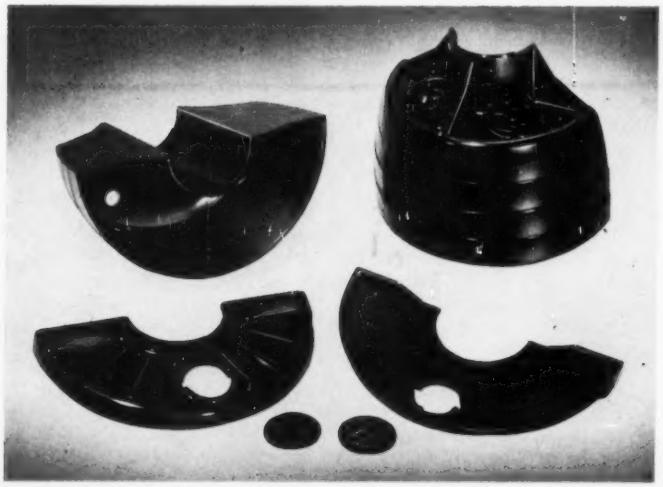
On a complete soap dispenser consisting of two halves and four valves, there are actually six molded parts, as shown in an accompanying photograph. These include two bowl sections, two lids, and two filler caps. Total weight of the parts is approximately 8 lb. 10 oz., divided as follows: bowls, 3 lb. 10 oz. each; lids, 10½ oz. each; caps, 1 oz. total. When assembled the finished dispenser and cover measure approximately 9½ in. high and 12 in. in diameter.

Plastic parts for the new Bradley dispenser are molded by Dickten & Masch Mfg. Co., Milwaukee, which company cooperated closely with Bradley on details of the finished design. The bowl section is produced in a two-cavity compression mold on a 300-ton press; the covers, also made in a two-cavity die, are run on a 250-ton press. For the small filler caps, a four-cavity mold is used on a 100-ton press. The only cooling fixtures required are used for the cover sections, to insure that they remain perfectly flat for a close, non-rocking fit. All assembly work is handled by Bradley.

With their durable construction, large, six-quart capacity, sanitary features, ease of cleaning and filling, and attractive design, the new molded phenolic soap dispensers mark still another proof that plastics mold modern living—not only in the home, but in industry as well.

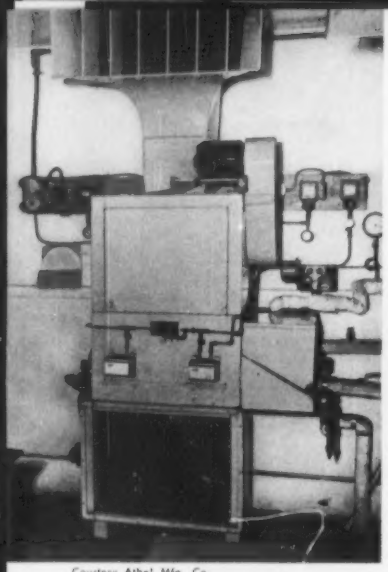
Brass unit, used before switch to phenolic, required a separate supporting tube at the bottom, had only three soap valves, and could dispense only one type of soap

Double-chamber phenolic model, in contrast to metal unit, is molded with supporting tube as integral part, has four valves, can hold two different types of soap



Phenolic parts of dispenser include self-contained halves of bowl (top); bowl lids (center) with molded openings through which bowl is filled; and filler caps (foreground)

TESTS FOR COATED



Courtesy Athol Mfg. Co.

Fig. 1—Atmosphere should be conditioned

THE plastics-coated fabrics and vinyl sheeting industries have always borne the burden of tailoring to and testing for end-use requirements of a wide variety of manufacturing customers.

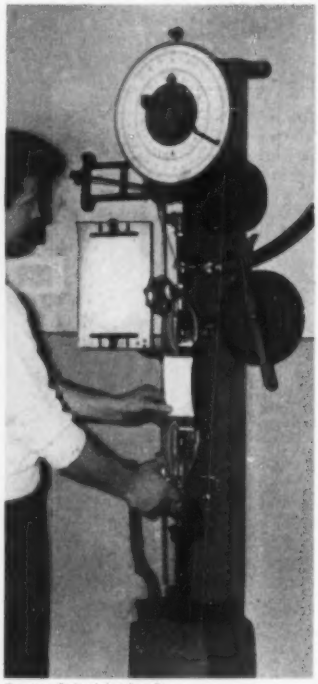
The materials they sell to various industries are composites of resins, stabilizers, plasticizers, pigments, and other organic and inorganic materials. Hence, finished sheet tests for specific strengths, abrasion resistance, weathering, flammability, heat resistance, chemical resistance, and other surface conditions have always been the rule. These tests have been the more essential because so many different types and qualities of materials may have great similarities in appearance and even in feel.

It was not until recently, however, that the test methods were standardized and agreed upon by all members of the Plastic Coatings and Film Association.

Conditions of Test

The standardized tests and test methods enable purchasers to check on whether the materials they are buying meet their specifications. But, more important, they enable purchasers to have specific and comparable information on the many variable properties that can be built into these materials.

The most important factor in achieving meaningful results from these tests is the conditioning of the plastics material sample which must contain the same degree of moisture and be at the same temperature as the surrounding atmosphere. In such conditions the material under test is said to be in equilibrium—showing no progressive change in weight after extended free exposure to the atmosphere in motion.



Courtesy Federal Leather Co.

Fig. 2—Measuring tensile strength

Of course, when tests are being run to settle a dispute they should be performed in a room conditioned by equipment similar to that shown in Fig. 1. This unit both refrigerates and humidifies the atmosphere to standard conditions.

The following abbreviated test descriptions are grouped according to the materials to which they apply; the remainder of this article summarizes the established test procedures.

Group I relates to tests on pyroxylin- and vinyl-coated materials.

Group II tests apply only to vinyl-coated fabrics.

Group III, tests on vinyl sheeting alone.

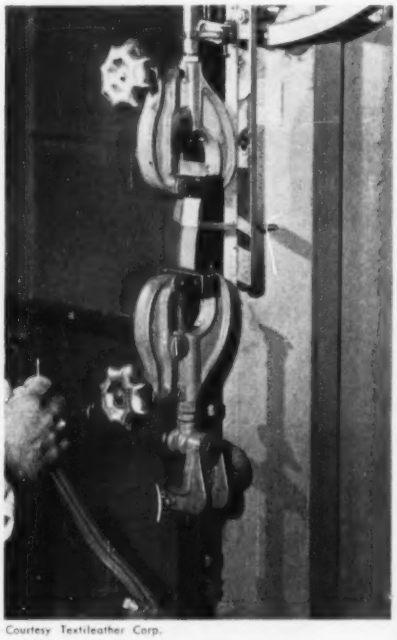
Group IV, tests applicable to pyroxylin- and vinyl-coated fabrics *and* vinyl sheeting.

Group V, tests on vinyl-coated fabric and vinyl sheeting.

Group VI, tests on pyroxylin-coated materials.

GROUP I

The *tensile strength* of pyroxylin- or vinyl-coated fabric, or its ability to resist stretching or breaking, can make a great deal of difference in the fabricating of end products. It is this "pulling strength" that is involved in the upholstery of furniture, in the covering of automobile seats and arm rests, and in the fashioning of shoes, and can be a deciding factor as to the suitability of a coated fabric for a particular end use and in methods of shaping



Courtesy Textileather Corp.

Fig. 3—Testing adhesion

FABRICS AND VINYL SHEET

Standardized procedures make it possible for end users to check physical properties of purchased materials

The whole matter of standards for plastics films, sheetings, and coated fabrics has been increasing in importance over the past year. Some phases have now been brought to a head because of sound leadership in the industry and magnificent cooperation at the technical level.

Commercial standard CS 192-53 has been announced for general purpose vinyl plastic film, covering films up to 10 gage. These standards are accompanied by a group of test methods.

In the fields of plastics sheeting over 10 gage, and coated fabrics, formal standards have not been established because: a) the wide variety of end uses of the heavier gage materials and coated materials makes for a more complicated set of requirements and b) technological changes in materials are many and frequent.

Because of these factors, the Plastics Coatings and Film Association has established standard test methods — not standards — for pyroxylin and vinyl resin coated fabric and all-plastic sheeting 10 gage and over.

This article is an illustrated presentation of these standard test methods in simplified form for the guidance of industrial end users of such materials. Furniture manufacturers, automotive body engineers, construction executives, luggage makers, shoe manufacturers, and many others will find much of interest here.

it to desired contours. The test, of course, is the pull which a material can withstand before breaking.

A pendulum-type machine, like the Scott tester in Fig. 2, is used to measure and record tensile strength. The machine is equipped with jaws which, clamped to opposite edges of a test sample, slowly move apart as greater load or pounds of pressure are exerted on them. This load is indicated on a dial at the top of the tester, so the exact pull a material is withstanding at the moment it breaks is recorded.

Figure 2 shows an operator completing the job of clamping the jaws of the machine on opposite edges of a specimen. A set of five specimens used have the long dimension parallel to the warp yarns, to test the warp tensile strength; another five have the long dimension parallel to the filling yarns, to test for filling tensile strength.

Tearing Strength

The resistance of a coated fabric, either pyroxylin or vinyl coated, to further tearing after an initial cut or tear has been made in the material, is more a fabricating than a service problem.

The test of tearing strength involves the determination of the resistance of pre-torn specimens to further tearing. Again a Scott machine is employed for testing and recording the results.

Specimens are taken both with the long dimension parallel to the warp yarns and to the filling yarns, in order to balance out variables. Longitudinal cuts are made in opposite sides of the short dimension of each sample and the diagonally opposite tongues thus formed are

Fig. 4—Determining the weight of the plastics coating

Courtesy United States Rubber Co.

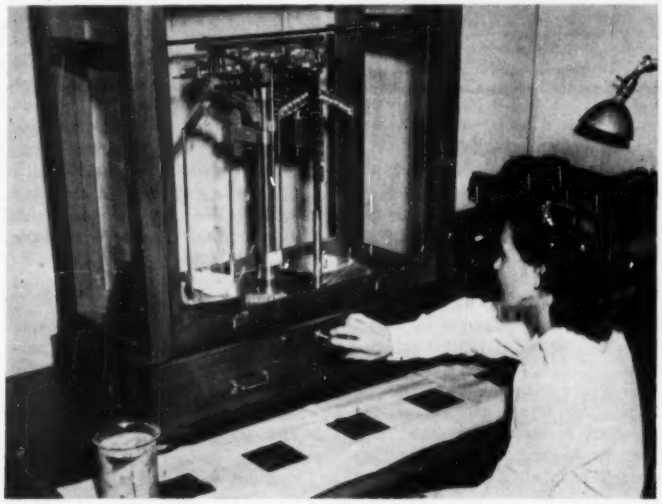


Fig. 5—Measuring hydrostatic pressure

Courtesy Federal Leather Co.

clamped into the opposing jaws of the tester. As the jaws move apart, the load or pounds of pressure necessary to continue the two tears in each specimen are noted on an autographic recording device. This type of record is necessary in this test since the load fluctuates. The tear strength of any particular material under test is the average of the five highest peak loads of resistance registered.

Adhesion of Coating

The affinity of coating and fabric backing, whether the plastic be pyroxylin or vinyl, affects primarily the serviceability of a material. When separation of coating from fabric backing occurs in the folds, at the turned edges, or on the surface, the greatest selling point of plastics—utility—is lost, along with its eye appeal. Poor adhesion between coating and backing can also cause flaking when a chair or other upholstered piece is being covered. The same problem can arise in shoe production where, for example, a plastics vamp is joined to the soling and strain is placed on the coating.

The test for adhesion records the force or pull required to separate the plastic coating from the fabric backing.

A Scott pendulum machine is also used in this test. In the case of both pyroxylin- and vinyl-coated fabrics, the coated faces of two test samples of different widths are first firmly bonded together.

For pyroxylin specimens, ethyl acetate welds the coated faces as they are dried (between glass plates) first in an oven and then at room temperature. Vinyl-coated surfaces are cemented with solvent or cement and then alternately dried at room temperature, in an oven, and again at room temperature.

With the samples welded together, the fabric backing of one specimen is carefully worked free from its coating, leaving one flap comprising fabric alone and another made up of two thicknesses of coating (cemented together) and the fabric that backs the second specimen in the lay-up.

As shown in Fig. 3, the single flap of fabric is placed in the lower jaw of the Scott tester, the double thickness of coating and fabric backing in the upper jaw. The machine is then set in motion with the jaws slowly moving apart. The average pull in pounds per inch of width required to further separate the coating from the fabric over a distance of 3 in., tests the adhesion of the coating.

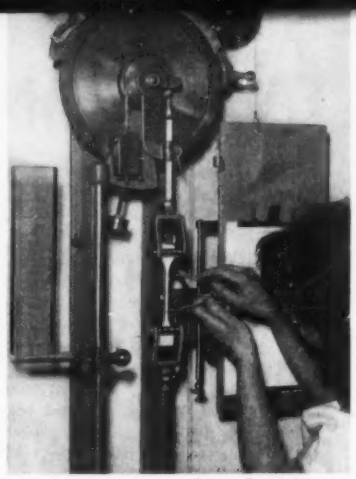
Weight of Coating

The weight of both pyroxylin and vinyl coating on a fabric is computed by subtracting the weight of the fabric from which the coating has been removed from the weight of the fabric with the coating intact.

Pyroxylin coating is removed with acetone, ethyl acetate, or other suitable solvent; vinyl coating is removed by soaking the back of the fabric with cyclohexanone and stripping. The vinyl backing must then be immersed in cyclohexanone, heated to approximately 180° F., for 3 to 5 hr., and rinsed in methyl ethyl ketone.

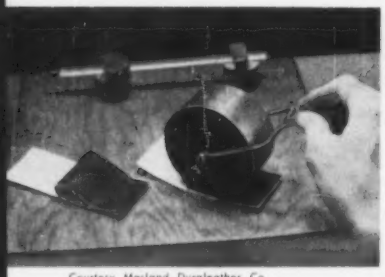
For accurate test results, free of humidity variation, both coated materials need to be heated for an hour in a 220° F. oven before weighing with the coating intact and before weighing with the coating removed.

Figure 4 shows the steps involved



Courtesy Respro, Inc.

Fig. 9—Measuring degree of elongation



Courtesy Masland Duraleather Co.

Fig. 6—Testing for cold crack

Courtesy Federal Leather Co.

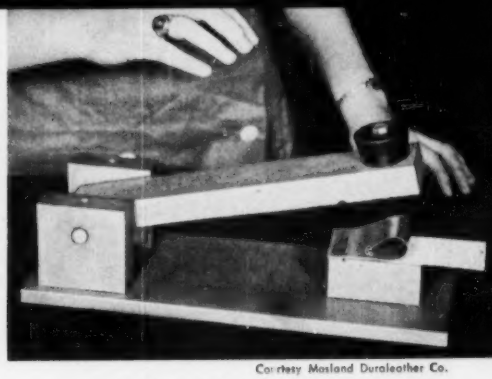
Fig. 7—Measuring abrasion resistance

Courtesy E. I. du Pont de Nemours & Co., Inc.

Fig. 8—Determining resistance to flame

Courtesy Bolta Products Sales, Inc.

Fig. 10—Taking readings on the tear strength of a specimen



Courtesy Masland Duraleather Co.

Fig. 11—Testing resistance to low-temperature impact

in an analysis of a vinyl-coated fabric. Immediately before the operator is the length of material from which five test specimens have been cut. The glass beaker, filled with cyclohexanone (left), holds these five samples which are being stripped of their coating. Five other specimens, dried according to specifications after their coating has been removed, are being weighed on the sealed balance.

Hydrostatic Pressure

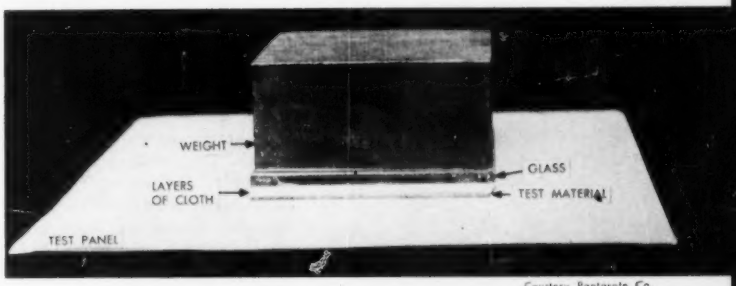
In service, fully coated plastics-coated materials are waterproof. It is this property that is so important to their use as a covering for outdoor furniture pads; sports car upholstery and lining; table cloths; juvenile furniture covers; and bar, restaurant, kitchen, and dinette upholstery. It is, in fact, one of the elements that makes plastics-coated materials so easy to clean, since liquids do not seep into the fabrics.

Figure 5 shows a specimen clamped, coated face down, in a Mullen-type modified hydraulic bursting strength machine. Water, introduced through the metal cup at the back of the test unit, is forced through the body of the machine and up against the coated surface of the sample. Four specimens of a given material are tested until droplets of water appear on the fabric backing.

Cold Crack Test

Tests for cold crack indicate the temperature at which fine or serious cracks will appear in a pyroxylin- or vinyl-coated fabric left in the cold and then sharply folded. Automobile manufacturers take advantage of the way plastics materials can be tailored to end-use requirements and specify a particular cold crack resistance temperature for their purchases.

For this test, the ends of each of two samples, one cut in the warp direction and one in the fill direction, are brought together with the coated side out and stapled to cards so as to form a smooth loop as shown at the left in Fig. 6. After the looped samples and a roller have been conditioned at a specified temperature for 2 hr., the roller is rolled lengthwise on the specimen, from the stapled to the looped end (right in Fig. 6). No pressure other than the weight of the roller is exerted by the operator. The samples are then examined for cracks.



Courtesy Pantasote Co.

Fig. 12—Testing resistance to lifting of lacquer or varnish from contacting surfaces

Abrasion Tests

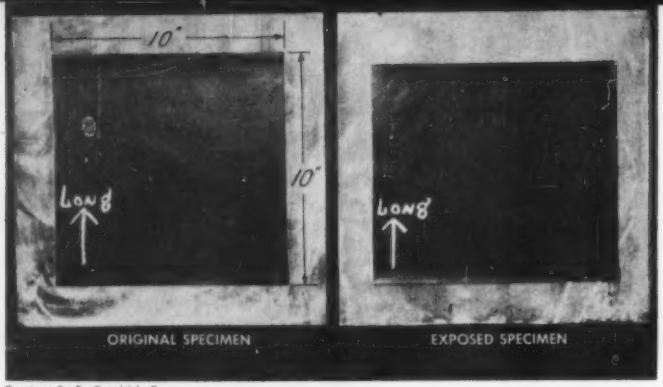
Abrasion resistance is a measure of the service a plastics-coated fabric will give the user, be it pyroxylin or vinyl. Abrasion acts upon almost all products—book covers, shoes, upholstery, hand bags, luggage—and is therefore of general concern to all users of these materials.

While no testing equipment will give accurate results of what wear will occur through years of use, testing in a systematic and uniform manner will give comparisons of the wear of different samples on a fair and equitable basis. The Wyzenbeek and Staff Precision Wear Tester, shown in Fig. 7, will render a test on the wearability of four samples simultaneously.

Each sample is held by two jaws on an armlike lever. This lever is equipped with a weight to provide

Courtesy Masland Duraleather Co.

Fig. 13—Determining effects of soapy water



Courtesy B. F. Goodrich Co.

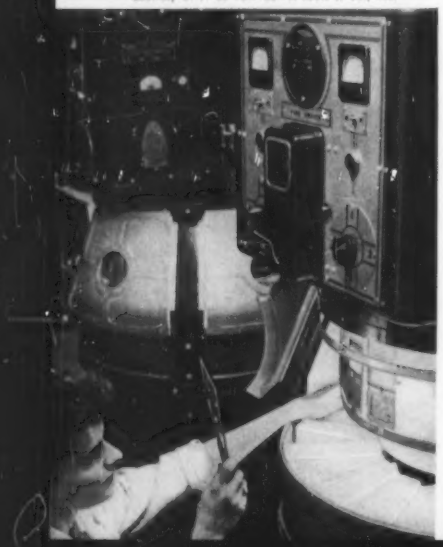
Fig. 14—Dimensional change is measured by exposing specimen to variations in temperature

Courtesy Firestone Plastics Co.

Fig. 15—Testing for resistance to burning

Fig. 16—Measuring heat and light stability

Courtesy E. I. du Pont de Nemours & Co., Inc.



the tension required to correspond to actual wearing conditions. The arms holding the samples are clamped down tightly over an oscillating drum covered with abrading cloth. The oscillations produce 5000 double rubs per hour.

The samples may be subjected to a specific number of rubs, then compared with each other or a standard sample or they may be left in the machine until worn completely through.

GROUP II

In the *flame resistance* test on vinyl-coated fabrics, a direct flame is brought into contact with a specimen for a given period and then removed. The test timing is of the duration of flaming and glow after the flame is taken away. This is a test of the fabric backing as well as of the vinyl coating, both elements having an effect on the results.

Figure 8 shows a test in progress with the sheet-metal shield, enclosing the sample and burner on all four sides to keep out drafts, removed for photographic purposes.

GROUP III

Tensile strength, or breaking strength, and the degree of elongation or stretchability of a vinyl sheeting are of particular concern to the operator fashioning the material into an end product. Thus it is necessary for a chair manufacturer, for example, to select sheeting that will not stretch so much that it thins out to an extent that detracts from its serviceability if pulled tautly over a chair seat or back.

Information on elongation is obtained simultaneously with that on tensile strength. The test consists of mounting, one at a time, 5 dumbell-shaped vinyl sheeting specimens between the jaws of a testing machine.

Any suitable apparatus may be used in which jaw separation can be adjusted to move at a rate of 20 in., ±1 in., per minute.

To determine elongation, an operator follows with dividers (as in Fig. 9) the separation of two parallel lines which were a measured distance apart on the original sample.

The ratio of the increase in the distance between the parallel lines at the time of break to the initial distance is the percentage elongation of the specimen.

Tensile strength, expressed in p.s.i., is calculated by dividing the pounds required to break a sample by the original cross-section area of the specimen expressed in terms of square inches.

Tearing Strength

The fabricator, fashioning vinyl sheeting into upholstery or luggage, is vitally concerned with tear strength for he *must* cut the material as he turns it into a finished article and needs to know just how much resistance the sheeting being used will offer to any further tearing action.

The tearing strength of vinyl sheeting is determined by the strip-tear method in which computations are made from readings taken on the movement of a pendulum dropped through a 20 mm. slit cut in the plastic material sample. Each pre-cut specimen is tested three times to see the amount of swing of the pendulum necessary to further tear the sample. It is important that the specimen completely tear through without hesitation.

Figure 10 shows an Elmendorf tester used to determine tear strength of vinyl sheeting. The cut sample is inside the machine.

Low-Temperature Impact

It is impact—the bouncing, jouncing, and sharp knocks which sheeting can receive in shipment, handling, storage, and in service—that leads to breaks in vinyl sheeting held at low temperatures. Tests for low-temperature bending in vinyl

sheeting must, therefore, involve impact and not simple bending.

Five specimens, cut in the transverse direction of a sheet, are looped with the finished side out and stapled to cards as shown in Fig. 11.

The impact test apparatus and the sample loops are placed in an insulated enclosure cooled to the desired temperature for one hour. Then, one by one, the specimens are put on the test anvil, as in Fig. 11. The arm of the tester is raised to a vertical position and then allowed to drop of its own weight on the sample which is then examined for breaks.

Lacquer or Varnish Lifting

Furniture upholstery, handbags, and automobile trim and linings are representative uses for vinyl sheeting which test a material's ability to remain in contact with a lacquered or varnished surface without damage to either material. For these and other plastics products that may come in prolonged contact with lacquered or varnished surfaces, it is essential that a vinyl formulation be used that will not cause lifting, tackiness, swelling, or other damage to either the plastic article or the finished surface.

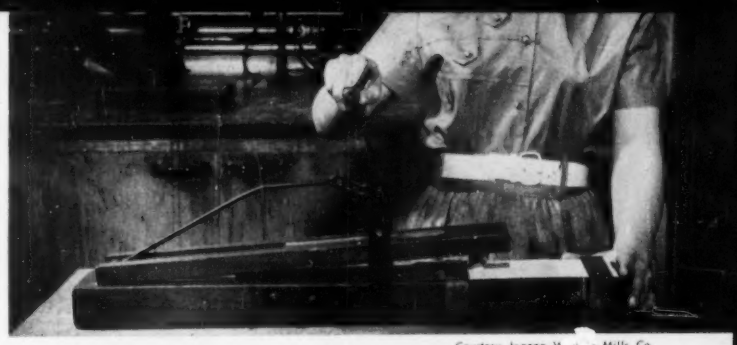
The test for lacquer or varnish lifting is plainly set forth in Fig. 12. The vinyl sheeting specimen under test is placed upon the lacquered or varnished test panel. Superimposed on the sheeting is a layer of cloth, a sheet of glass, and a 1-lb. weight. This assembly may stand for 24 hr., 72 hr., 1 week, or whatever period is desired. At the end of the prescribed period there must be no evidence of any ill effects from the contact of the lacquered or varnished surface with the vinyl sheeting.

Soapy Water Extraction

This test serves to indicate the resistance of a vinyl sheet to surface dulling and to drying due to extraction of the plasticizer as a result of extended contact with water. These are important considerations when a material is used for end products that are washed a lot or otherwise continuously or frequently exposed to water. Examples are outdoor furniture, dinette chairs, and sports car upholstery.

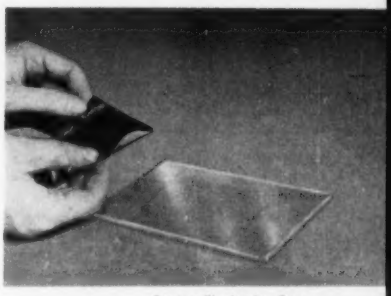
Soapy water—1% Ivory soap solution in distilled water—is the test medium. Three specimens of vinyl

(*Continued on p. 196*)



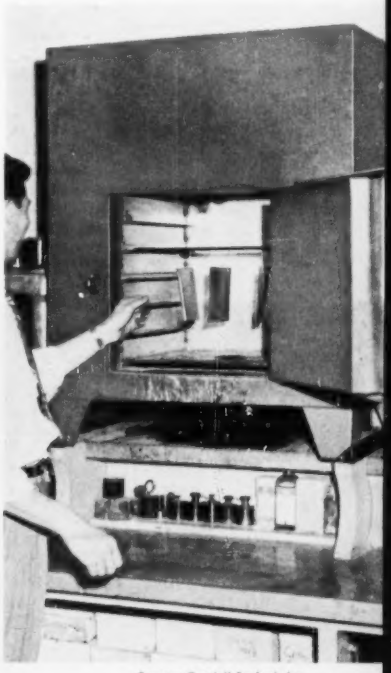
Courtesy Joanna W[illegible] Mills Co.

Fig. 17—Determining fastness of the basic color of spe[illegible] to crocking



Courtesy The Landers Corp.

Fig. 18—Rating degree of surface tackiness

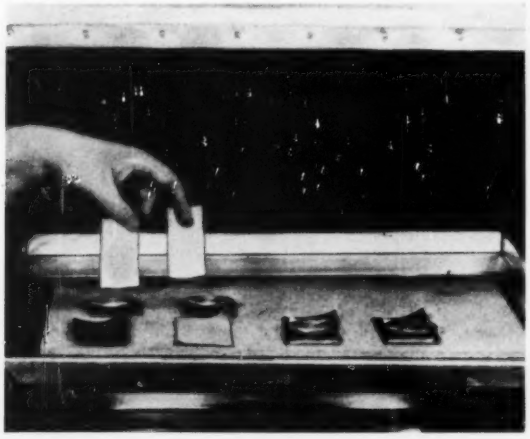


Courtesy Goodall Sanford, Inc.

Fig. 19—Determining degree of volatility

Fig. 20—Measuring amount of excess oil present in specimen

Courtesy E. I. du Pont de Nemours & Co., Inc.



PLASTICS

Plastics take to the air in the form of a high-flying, maneuverable children's kite made of 0.00125 in. thick Geon vinyl film. The feather-light kite, weighing less than 1 oz., will hold up under rough handling, rain, and high winds. Film is cast and gravure printed in bright colors by Reynolds Metals Co., Gary, Ind.; kite sold by the Hi-Flier Mfg. Co., Decatur, Ill.

Durable ring coasters, made from 20-gage Geon vinyl and measuring approximately 5 in. in diameter, are large enough to hold items that range in size from small glasses up to flower pots, candlesticks, or ashtrays. The coasters are embossed with a decorative rope-like texture and have a raised edge that prevents liquids from spilling over or glasses from sliding off. They are available in a series of light pastel shades that blend equally well with indoor as with outdoor decors. Coasters are made by Hedwin Corp., 1525 W. 41 St., Baltimore 11, Md.

Three-dimensional plaques, vacuum-formed of Celanese acetate, add a realistic touch to a children's painting kit. The four white plaques—each one formed in a caricature of an animal or clown—can be painted, wiped clean with a wet cloth, and then repainted. In addition to the plaques, kit has water colors, paint brush, and water pan. Manufactured by Pancordion, Inc., 461 8th Ave., New York, N. Y.

Two-piece crumber set, consisting of a rugged molded acetate scoop and a brush with an acetate handle, is a convenient household accessory for quickly whisking crumbs or ashes from the table. When the set is not in use, the tapering handle of the brush can be slipped into a slot molded-into the top of the scoop and both pieces can be stored or hung on the wall as a single unit. The set, called the Silent Maid, is available in a contrasting maroon and ivory color combination with a matching scroll molded along the edges of both parts. It is made by Wecolite Co., 552 W. 53 St., New York 19, N. Y.

PRODUCTS

Toy submarine, realistically molded of styrene, can actually fire two toy torpedoes as it floats just beneath the surface of the water. The torpedoes, also molded of styrene, are inserted in torpedo tubes on either side of the grey hull. When a trigger on the deck of the sub is pulled back, both of the harmless, lightweight torpedoes are propelled forward by a spring mechanism, travel for a few feet through the water, and then rise to the surface and float. The 12 in. long sub is manufactured by Ideal Toy Corp., 200 Fifth Ave., New York 10, N. Y.

Telephone holder is molded of black Tenite II cellulose acetate butyrate in two parts—a resilient shoulder piece padded with foam rubber and an adjustable arm which snaps onto the hand-set without the use of tools. The holder braces the hand-set against either shoulder, leaving both hands free. Made by Rans Mfg. Co., 28 North Williams St., New York 38, N. Y.

Afternoon tea for the young hostess is brightened by the addition of an attractive children's tea set molded of styrene. The set, consisting of a large tea pot, a sugar bowl, a creamer, and a tray with handles, is copied from an actual Sheffield pattern and is molded to scale. With the exception of the tray, which is colored to simulate a wood grain, all the parts in the set, including the tray handles, are metallized to produce a brilliant silver-like finish. The service can be washed after use without losing its shiny look. The Heirloom Tea Set is made by Banner Plastics Corp., 80 Beckwith Ave., Paterson 3, N. J.

Durable, lightweight electric lamp, molded of Plaskon urea, can be adapted to do a variety of utility jobs. The unit, weighing only 3½ oz., is supplied with a convenient clamp that permits it to be attached to note boards, books, music stands, or wherever else an extra source of light might be needed. The lamp is available from Cable Electric Products, Inc., 234 Daboll St., Providence, R. I.

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Heating With Far Infra-Red

Non-color conscious characteristics of radiation make it equally efficient for heating all colors of plastics used in coating, forming, and embossing

by Frank Perrotta†

INFRA-red radiation has been used as a heat source by the plastics industry for many years. Its applications include drying and preheating materials as well as curing and fusing resins. Most familiar source of infra-red radiation is the standard "heat-lamp," which produces its heat in or near the visible portion of the spectrum. Such radiation is transmitted by transparent materials and is almost entirely reflected by white opaque materials. The bulbs of these lamps operate at a filament temperature of 4873° F.

The inherent advantages of infra-red radiant heat have been made more widely applicable by the development of a heat source entirely different from and more efficient than the conventional infra-red bulb. This new source, consisting of a Chromalox tubular heater, entirely enclosed in an Inconel sheath, operates at a surface temperature of 1000 to 1400° F., and hence its radiation is completely in the invisible or "far infra-red" portion of the spectrum. The effective wavelength range is from 2 to 16 microns and the radiation emanates from the heater unit in a focussed pattern. These units are being manufactured by Edwin L. Wiegand Co., Pittsburgh, Pa.

The big difference between infra-red radiation from a heat lamp and far infra-red radiation from a Chromalox unit is that the latter is not color conscious; that is, it heats all colors of materials uniformly from white through black, with maximum absorption and negligible reflection even by white. This factor of uniform heating is of particular value in such applications as fusing plastisols or organisols and heating film and sheet prior to embossing or vacuum forming.

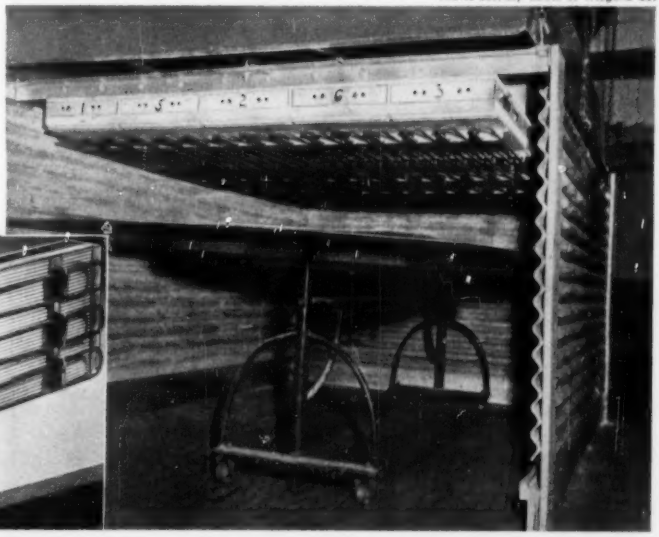
Heaters

In one commercial type of far infra-red heater, the heater element is positioned at the focal point

* Reg. U.S. Pat. Office

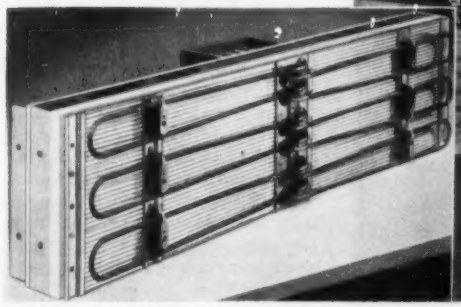
† M. B. Rosevear Co., Bloomfield, N.J., Mfg. Representative, Edwin L. Wiegand Co.

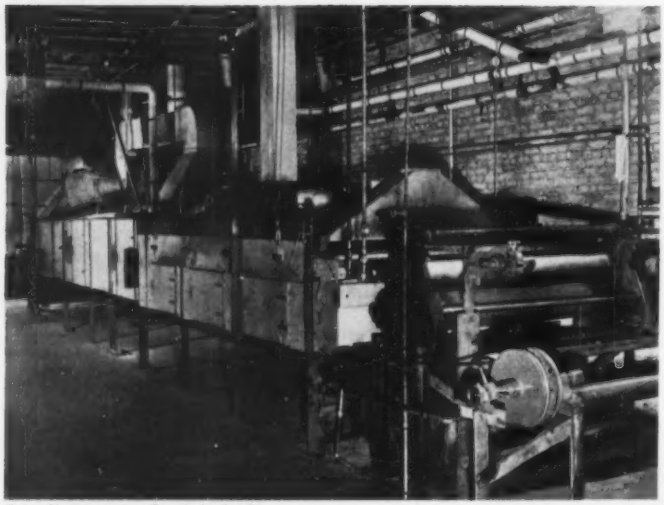
Photos courtesy Edwin L. Wiegand Co.



Latest type of far infra-red radiant heating panel provides complete oven wall construction, including structural members, insulation, and air venting space. This type of "package heater" needs no cooling

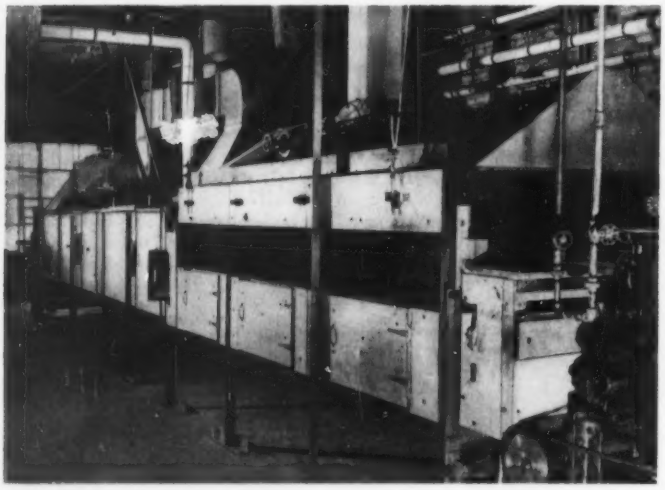
Below: One unit of heating panel, five of which are shown in use at the right





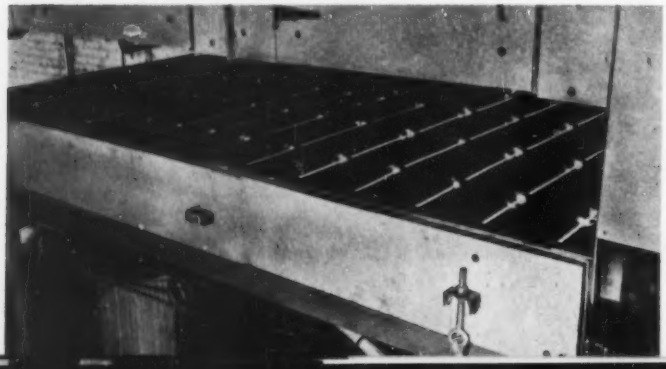
Photos this page courtesy Georgia Leather Co.

Coating, fusing, and embossing machine with far infra-red heaters in fusing section



If machine stops, a hoist automatically raises the heater section some 18 inches

Interior of fusing section, with its reflector type far infra-red heaters energized



of a parabolic reflector formed of Alzac, an aluminum alloy which retains its high polish under elevated temperatures and provides the most efficient reflective surface obtainable for far infra-red. The reflector fits into a one-piece aluminum extrusion which forms the housing and structural member of the complete heater unit. The terminal ends are completely housed and are supported in ceramic blocks. The heater element itself is suspended on insulating bushings for secondary insulation.

The heart of this far infra-red heater unit is, of course, the heating element itself. These elements, available in many different forms, can be engineered into ovens of almost any design, either with or without standard reflector assemblies. In any case, temperature control is accomplished by using an input controller or time cycle device which will vary the "on" time from nearly 0 to 100 percent. Due to the low temperature lag of the heater element, smooth temperature control may be maintained from nearly zero to full heat.

The following paragraphs are from actual case histories of design problems encountered in developing equipment for various fusing, curing, and heating operations.

Fusing Plastisols

The manufacture of unsupported film from plastisols by the casting process involves production speeds ranging from 10 to 50 yd. per minute. The highest speed is normally employed when the material is not to be embossed as one of the steps in a continuous operation; the lower speeds are normally used whenever embossing is to follow the fusing process, because of the limiting factors in the embossing operation.

When work was first undertaken on a far infra-red oven for a film casting company, the objective was to speed up the operation which was then being handled by a convection type oven. A period of 60 sec. in the oven at a temperature of 400° F. was required to fuse the material. After some experimental work, it was proved that the same thickness film could be fused with far infra-red at the same ambient oven temperature of 400° F. in 10 seconds. From this fusing time it

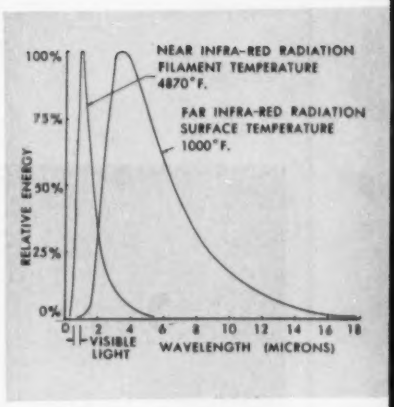
was simple to calculate that a required maximum speed of 50 yd. per min. could be obtained with an oven length of approximately 25 feet. It was also determined that by spacing the radiant heating units on 8-in. centers, using reflector sheets between the units, and spacing the heaters 1½ in. from the work would result in very satisfactory production. It was necessary to allow a 2- to 3-in. overlap of the heaters over the material width. For example, if 72-in. material is to be produced, a 7-ft. radiant heater unit with a heated length of 78⅜ in. would be required. This overlapping insures adequate fusing at the edges of the web.

Some non-flammable fumes are given off when plastisol is fused, and for this reason a certain amount of ventilation must be provided. Merely omitting two or more reflector sheets at the exit end of the oven and providing a hood which vents to the atmosphere, is generally sufficient. If a blower is found necessary for ventilating purposes, it must be of a capacity sufficient only to carry off the fumes and not great enough to induce forced circulation in the oven. Any circulation of air in the oven will, of course, necessitate additional heating capacity to maintain the desired oven temperature.

Although in this installation the oven temperature is only 400° F., the actual temperature on the film itself, because of the radiant heat, is between 600 and 700° F. Since the machine must sometimes be stopped to rectify problems or examine the product, it is necessary, because of the comparatively high heat on the surface of the film, to arrange a means for automatically raising the heaters or turning them away from the work in order to prevent burning of the plastisol film and the carrying web. If the heaters are designed to be raised away from the work, a lift mechanism should be provided that will function the instant the machine is stopped. If the heaters are turned away from the work, the mechanism must be designed to turn them a full 90 degrees. A simple rack and pinion arrangement will do.

When producing unsupported film, the plastisol is uniformly dispersed on a carrier which is usually a web of paper. This paper sheet must be pre-heated to remove any moisture which would cause small imperfections in the film. To accomplish this, a separate bank of radiant heaters is positioned above the carrier web just prior to the point where it enters the casting unit. Although there are many variables, such as the speed of the web and the degree of humidity in the air, it has been found by experience that one radiant heater unit with one reflector sheet should be used for approximately every 1½ yards per min. of web speed. Therefore, on the basis of a speed of 50 yd. per min. between 33 and 36 units will be required.

It is necessary that power input control be available to operate an oven of this type satisfactorily. The speed of web travel as well as the thickness of the film being produced affect the required heat input. For example, in one plant with 0.004-in. film running at 50 yd. per min. and the number of oven heaters calculated as described above, satisfactory production was obtained with the heater controls turned "full on." However, when the operator reduced the film thickness to 0.002 in., with all other factors remaining constant, excessive blistering developed because of over-heating. By reducing the heat input approximately 30 to 40%, satisfactory fusing of the plastisol was again obtained.



Spectral energy distribution curves showing wavelengths of far infra-red

More versatile heat control in an oven of this type can be achieved by separating the radiant heating elements into two or more separate banks, each with its input controller.

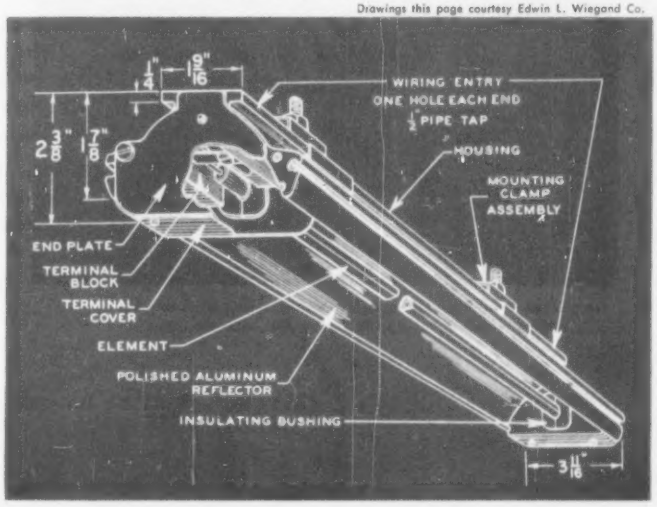
Organosols

The application of radiant heaters for fusing organosols is basically the same as that described for plastisols with the one important exception that means must always be provided for removing explosive volatiles. The fire underwriters require that 10,000 cu. ft. of air be

(*Continued on p. 114*)

Construction details and component parts of far infra-red radiant heater with reflector

Drawings this page courtesy Edwin L. Wiegand Co.



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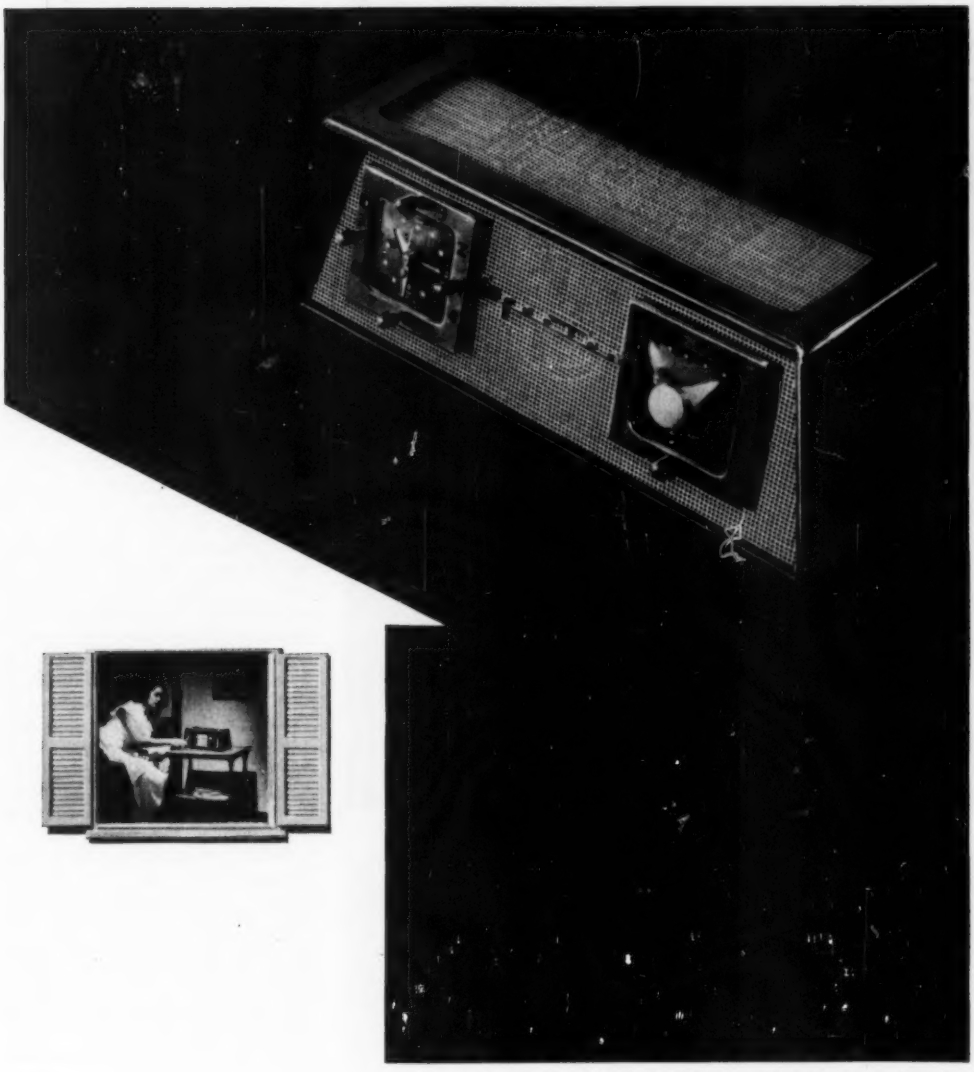

Sparton Radio Cabinet molded by Chicago Molded Products and Detroit Macoid Corporation for Sparton Division of Sparks-Withington Co.

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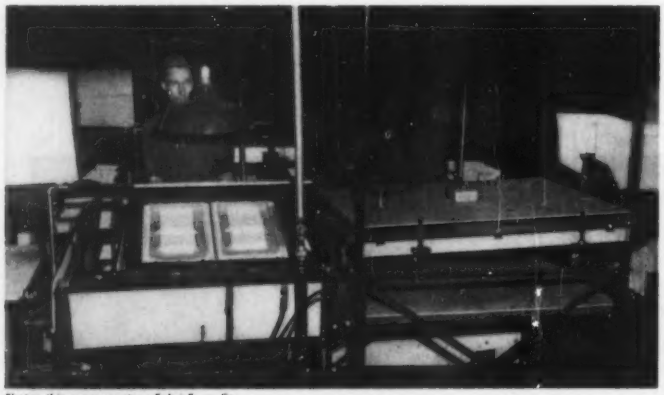
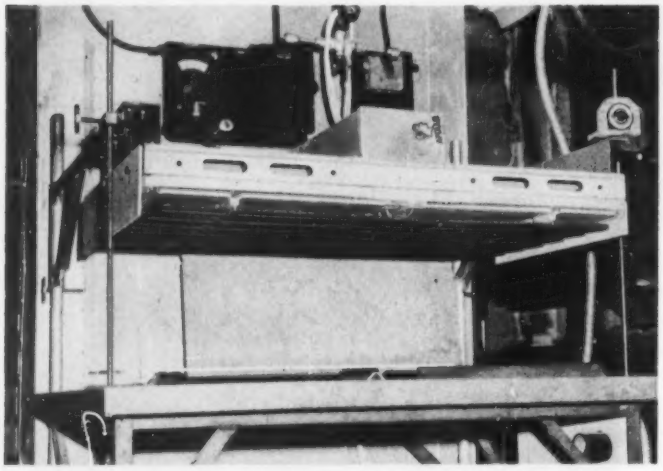


Photos this page courtesy Fabri-Form Co.

Far infra-red is used to heat thermoplastic sheet before vacuum forming. Here the heater, on its carriage, has been rolled to the right while operator removes formed parts



An experimental set-up for heating thermoplastic sheet for vacuum forming. The heater panel is made up of a number of standard units with built-in structural steel frames

circulated through the oven for every gallon of solvent in the oven at one time.

The total number of heaters which is required for fusing organosols is determined on the same basis as for plastisols. The additional heat required to bring the vented oven to approximately 400° F. is then calculated by means of the following formula:

$$\text{K.W.} = \frac{(\text{C.F.M}) \times (\text{T.R.F.})}{2960}$$

where K.W. = Kilowatts of power, C.F.M. = cubic feet of air circulated per min., and T.R.F. = difference between room temperature and oven temperature in ° F.

The number of K.W. is then added to the basic figure for fusing to obtain the total heater requirement.

If either plastisol or organosol is to be deposited on a web in such a manner as to coat or impregnate this web, far infra-red fusing requirements can be determined by the same general calculations as described above.

The supporting web itself must be completely free of moisture before coating or impregnation; a bank of heater elements similar to those used for driving the moisture from the paper carrier used in the manufacture of unsupported film is required.

Embossing

Embossing equipment usually includes two rollers, one heated and the other cool. However, in many cases the heat from the heated roller is not sufficient to permit a deep and permanent emboss and, when either supported or unsupported film is to be embossed, it is generally necessary to preheat it before passing it through the embossing rolls.

A general rule to follow for preheating supported film by far infra-red is to use one heater for every yard per minute. For example, for a speed of 15 yd. per min. of supported film through the embossing rolls, 15 standard heater units should be used. If unsupported film is to be embossed, one heater unit is required for every 1½ to 2 yd. per min. of film 0.004 in. or less in thickness.

Coating

The Suflex Corp., Woodside, N.Y., has for some time been one of the major manufacturers of a flexible tubular product of braided cotton, rayon, or fibrous glass impregnated with various materials such as varnish, lacquer, or vinyl plastisol. The company recently decided to expand its line to include the manufacture of tubing or sleeving coated with a continuous film of plastic. This product has a high dielectric strength due to great build-up and uniformity of the plastic film.

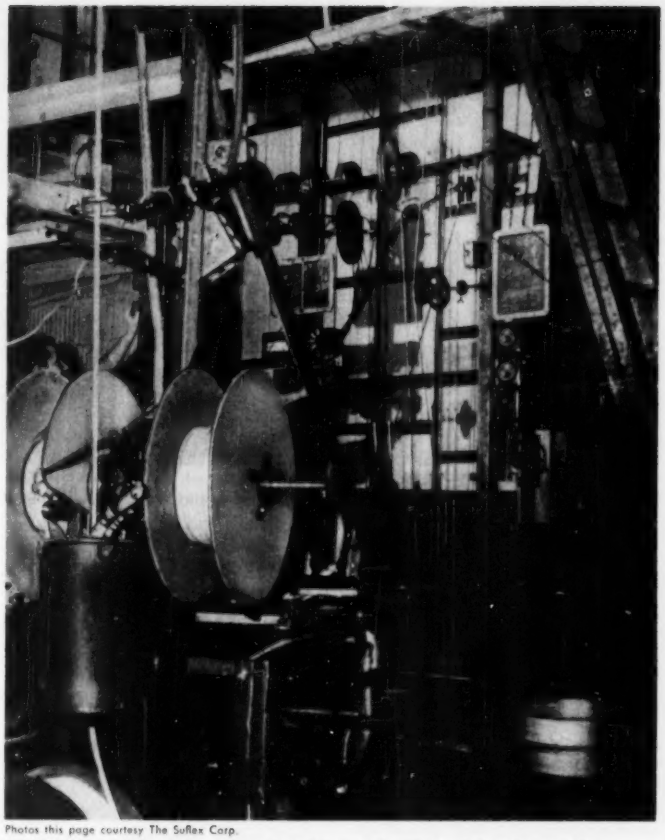
Other manufacturers of similar material had previously used a horizontal arrangement for coating and curing. Convection ovens were employed and the length of curing time ranged from 3 to 20 minutes. Suflex, however, decided to use a vertical arrangement which would permit production of a better quality product with closer control of the coating thickness. A vertical curing oven was constructed, open at both ends and with mill-finish aluminum to provide an efficient reflective surface. Four far infra-red double element heaters, each 6 ft. long, were mounted vertically on one wall of the curing oven. A series of sheaves or pulleys was arranged at the top and bottom of

the tower so that the tubing or sleeving could make multiple passes through the coating machine and the curing tower.

The braided tubing is first produced on special high speed braiding machines and is made in sizes from 0.020 to a maximum of 5 in. inside diameter. A reel of braid is mounted at the first stage of the coating equipment. As the braid comes from the braiding machine it is flat and the first step in the operation is to bring the braid to a perfect cylindrical shape by passing it over a heated former. The braid then passes through a gas flame and directly through the vinyl plastisol applicator. Here a special metering device controls the exact thickness of the plastisol which is permitted to remain on the outer surface of the braid. In the first pass through the oven, the plastisol is partially fused so that the outer surface is not tacky. When the braid reaches the top of the tower, it passes around a sheave and then goes down through the oven once more for additional curing; it then goes again through the applicator. This equipment is designed so that a maximum of nine passes may be made through the plastisol applicator with each pass, of course, building up an additional thickness of wall. The thickness of each coating may be controlled by the viscosity of the plastisol as well as by the setting of the metering device.

This oven design has been so successful that instead of requiring a minimum of 3 min. for curing or fusing the vinyl plastisol, it is now possible to fuse the material in 20 sec. at a speed of 16.7 ft. per min. for most of the plastisol resins which are now being used for coating. Flexibility of the far infra-red curing tower operation is so great that experimental work on curing resins which require different temperatures and times is easily carried out, including the fusing of Teflon at temperatures in excess of 600° F.

These brief case histories of varied applications of far infra-red heating indicate future possibilities of the method. With it, many processes can be speeded up or run at the same speed in smaller equipment; and, in all cases, the operator has full and precise control of temperature variations.



Photos this page courtesy The Suflex Corp.

Braided fibrous glass tubing is formed at left, coated with plastisol at lower right, then passes through vertical curing oven which incorporates far infra-red heaters

Looking down from the top of the tower on which plastisol coated tubing is produced. The coating bath is in the foreground and tops of two curing ovens are in the center

Courtesy Lockheed Aircraft Service, International

Fig. 1—Fabricated plastics baggage racks were large part of conversion job

Courtesy Le Conte Plastics, Inc.

Fig. 2—Rack webs have built-up cellular cellulose acetate core

Courtesy Le Conte Plastics, Inc.

Fig. 3—Impregnated glass cloth is placed over the web core

Plastics Save Weight in Aircraft

Conversion of DC-6 planes to tourist service is expedited by use of sandwich constructions

BECAUSE of the increasing demand for air tourist travel space, American Airlines recently decided to expand the size and capacity of its fleet available for this service. It was determined that 12 DC-6 planes could be assigned to this type of operation but, because of the lower fare for tourist service, the seating capacity would have to be increased from the 52, which the planes could accommodate in deluxe service, to 80 for the less expensive service. American contracted the development of this modification to Lockheed Aircraft Service, International.

Weight Reduction

To increase the seating capacity of these planes by 50%, the entire interiors, excepting only the pilots' cockpit, had to be rebuilt. One important factor in this conversion was weight reduction, and it was here that plastics played an important role.

One of the biggest jobs was to convert the tracks originally designed to carry only such light items as briefcases, pillows, and blankets for possible use as weight carrying baggage racks (Fig. 1), capable of safely holding heavy suitcases and parcels under all flight and landing loads. The lower surface fairing of the luggage rack was designed to contain reading lights and cold air diffusers. Another phase of the conversion was the development of a compartment for a drinking water tank.

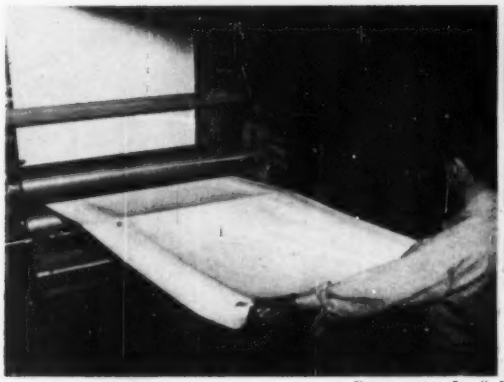
Since a high strength-to-weight ratio on these jobs was a must, Lockheed decided to investigate plastics. As a result, Le Conte Plastics, Inc., Farmingdale, L.I., N.Y., was approached and, with American Airlines' approval, an agreement was reached for the development of the required parts as a cooperative venture between Lockheed and Le Conte, with one company furnishing the aircraft design data and the other the plastics fabrication know-how.

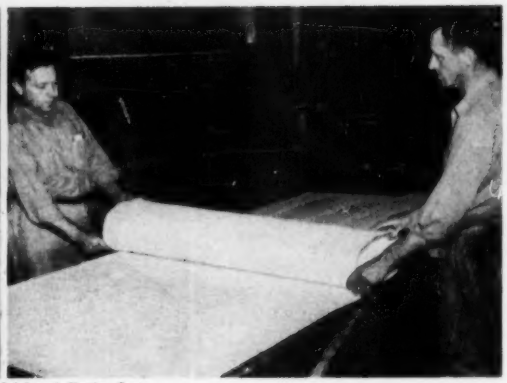
It was immediately apparent that the best material would be a structural sandwich having a light core and strong skins. Comparisons were made between aluminum and plastics sandwich constructions and the plastics type was selected because: a) the deck surface would not dent and, b) the material had noise absorption and vibration damping qualities.

Final step in the development program was the construction of a

Courtesy Le Conte Plastics, Inc.

Fig. 4—After the web has been cured, top plate of the mold is removed. The set screws in foreground are then loosened and the finished web removed from mold





Photos courtesy Russell Reinforced Plastics Corp.

Fig. 5—Glass cloth for deck sandwich is impregnated with resin

Fig. 6—Top skin is laid over deck sandwich "filler"

test section of a baggage rack consisting of the deck and divider sections or webs, using a Strux cellular cellulose acetate core with polyester-impregnated glass cloth skins.

Test Results

The cores of the webs consisted of strips of Strux inserted in two lengths of aluminum channel as shown in Fig. 2. After the webs had been covered with skins of resin-impregnated glass cloth, they were assembled to a deck section. The assemblies were then tested for total weight-carrying capacity. It was found that no failure occurred with a downward load on the deck of 400 lb. and a forward load, against the webs, of over 600 pounds.

With these satisfactory test results established, a mold was built to produce the webs. The lower section of the mold is shown in Fig. 3. In this illustration the operator has placed the aluminum channel-Strux assembly in position between locating pins and is laying-up impregnated Fiberglas cloth on the upper surface. The skin for the lower surface has already been placed in position. Next step is to place a metal bar in position between the set screws shown at the right of the illustration and the open edge of the Strux. The set screws are then tightened to hold all the elements rigidly in position. After a polished plate is placed on top of the lay-up, the entire assembly is placed in a press where the sandwich is cured under pressure.

Figure 4 shows the cured web just as the top plate is being removed. Finishing consists of machining the side of the web which is not supported by the aluminum channel. Because of the shape of the walls of the fuselage, a different templet is required for machining this contour on each web.

Since the deck of the baggage rack consists of 8-ft. sections of flat Fiberglas-Strux sandwich panels (Figs. 5 and 6), these sections were molded by standard methods.

In the case of the shaped fairing, however, it was necessary to produce an aluminum mold having the exact contours required. In Fig. 7, the operator is laying up tailored sections of Strux on the lower impregnated Fiberglas skin. After these sections of Strux have been carefully positioned, the top impregnated skin is laid on and the top half of the mold is located on top

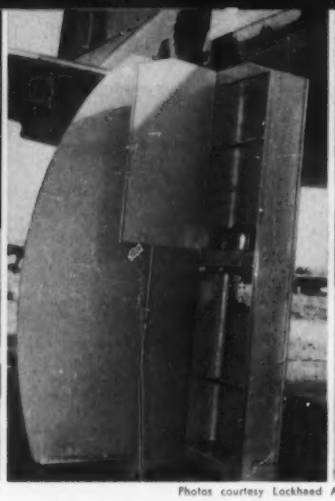
Fig. 7—Cellular cellulose acetate sections are placed in fairing mold

Fig. 8—Top half of metal mold being removed from cured fairing

Photos courtesy La Conte Plastics, Inc.

Courtesy Le Conte Plastics, Inc.

Fig. 9—Panels are easily fabricated



Photos courtesy Lockheed Aircraft Service, International

Fig. 10—Completed water tank compartment

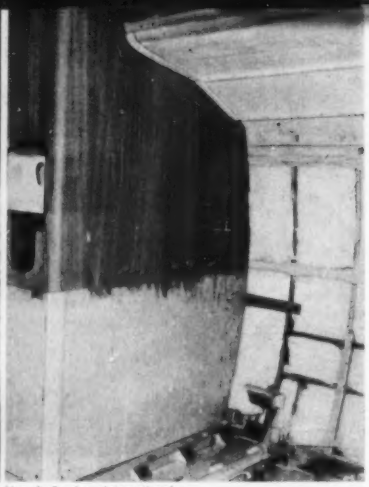


Fig. 11—Water tank compartment in position

of the entire lay-up. Curing is completed under pressure, after which the molds are removed from the press and the finished fairing (Fig. 8) is taken out and the flash trimmed off.

Water Tank Compartment

The water tank compartment required for conversion of the DC-6 planes is fabricated of panels of the same sandwich type as used in the fairings. Figure 9 shows how a Strux-Fiberglas panel is cut with a saber saw. The completed water tank compartment, without the tank in position, is shown in Fig. 10 just before it is to be taken into the plane and mounted in position.

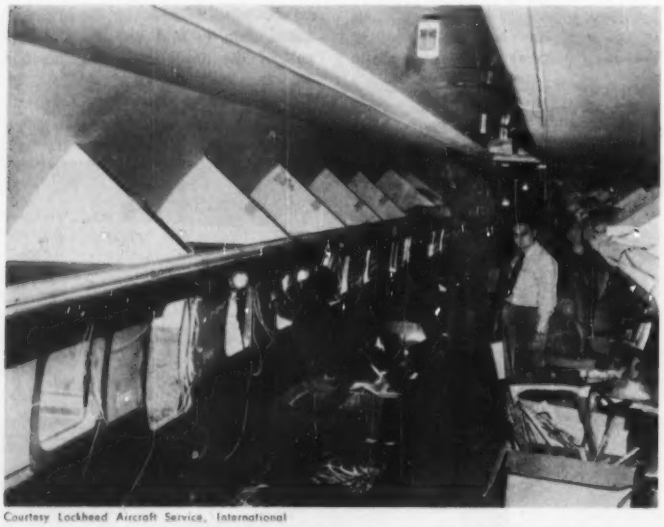
Figure 11 shows the water compartment in position, with the upper section trimmed with Formica Realwood laminate.

Figure 12 illustrates the complexity of the all-over conversion job on the DC-6 planes. On the left of this illustration is shown the method of assembly of the webs and deck sections of the baggage racks, using a 3-point suspension. A round aluminum hand rail is bolted to the outer edge of the deck and to the lower front end of each web. In addition, the deck is bolted to the underside of the web by a number of basket nuts. The back upper corner of the web is fastened to the plane fuselage by means of a special clip and bolt assembly. Underneath the deck is the contoured fairing. The mechanic in the left foreground is assembling and wiring the lighting fixtures. The operator to the right is locating one of the webs preparatory to bolting it in position.

Some interesting weight and assembly comparisons can be drawn between these plastics applications and the metal ones previously used. The plastic luggage racks save 143 lb. over the previously used metal construction. In an 80-in. section of the metal rack there were 128 different parts, each of which had to be assembled in the confined quarters of the plane. The plastic conversion has only four major components in each 80-in. section.

According to Lockheed, polyester-glass surface of the deck will not dent or mar under the impact of heavy baggage. Even more important, from the standpoint of passenger comfort, is that, because of the excellent vibration damping effects of the sandwich structure, motor noise inside the plane has been greatly reduced.

According to Neal Thomas, chief engineer of Lockheed Aircraft Service, International, this cooperative plastics development effort has contributed largely to the satisfactory completion of the American Airlines DC-6 conversion program.



Courtesy Lockheed Aircraft Service, International

Fig. 12—Conversion job partially completed; webs and deck sections are being installed

pacemaker

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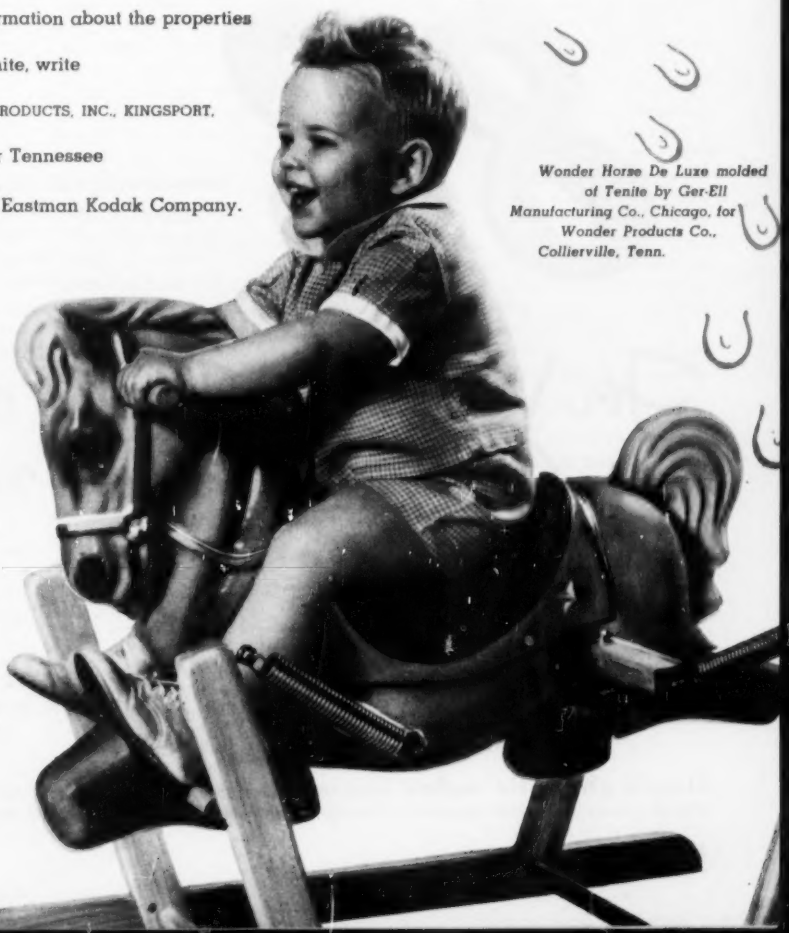

Wonder Horse De Luxe molded of Tenite by Ger-Ell Manufacturing Co., Chicago, for Wonder Products Co., Collierville, Tenn.

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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

A Heat-Resistant Phenolic Resin†

by Elmer Warnken††

THE field of plastics has for many years been bounded by the limitations of elevated temperatures. There are many applications which could be served well by plastics had they the ability to withstand the effects of long exposures at elevated temperatures.

Consequently, with the advent of fibrous glass as a reinforcing medium, the search began for a resinous bonding material that could utilize the heat resistance of glass fabric in addition to its favorable physical characteristics.

Applications

There are numerous applications wherein such a reinforced plastic could be used. The high strength-to-weight ratio immediately suggests the aircraft industry. A definite advantage is found in the low specific gravity of the plastic and in most cases, the physical properties are comparable to, or better than, standard aircraft metals such as magnesium and aluminum. In addition to this, great savings in fabricating costs could be realized since the low-pressure molding techniques would allow parts to be fabricated of plastic materials at a reduction of labor costs. During World War II a great quantity of parts were made of reinforced plastics which replaced critical materials, reduced the cost, and reduced the need for highly critical manpower. However, these materials were limited to applications where the temperature was ambient or slightly above.

In the interim between the end of World War II and the present time, many advances in heat-resistant plastics have been made. The silicone[1] and the triallyl cyanurate polyester[2] resins were perfected. Approximately four years ago initial work was inaugurated on the development of a heat-resistant phenolic low-pressure laminating resin. One apparent difficulty was the fact that the phenolic resin, to a greater extent than any of the other heat-resistant resins, releases volatiles during the curing reaction. However, a low-pressure laminating resin having elevated temperature resistance was developed, and is designated as CTL-91-LD.

Types Available

This material is provided as a liquid resin or in a dry lay-up or preimpregnated fabric form. It is adaptable to both low-, moderate-, and high-pressure molding techniques. The resin does not lend itself readily to shipping due to its lack of shelf-life. The preimpregnated fabric is stable in its B-stage form for many months. Packaging improvements through the use of polyethylene separator sheets have further improved the storage qualities of the impregnated fabric. The latter is offered in three standard grades. The first, or FF grade, is readily adaptable to the cellophane-lagging technique for fabrication of ducting. The second, or CTL-91-LD 40/40/30, is the most satisfactory for intricate forms where high drape and maximum heat resistance is required. It will mold at bag molding pressures or through use of direct compression sheet molding methods. The third, or CTL-91-LD 40/75/30, is primarily used for the fabrication of flat sheets in direct compression plastic molding presses or for less severe lay-up applications.

The properties of CTL-91-LD are shown in Table I. Better properties

[1] Modern Plastics *30*, 146 (Nov. 1952); *29*, 106 (Apr. 1952).
[2] Modern Plastics *29*, 113 (July 1952); 116 (July 1952).

Table I—Properties of Laminates Made with CTL-91-LD Resin and 181-114 Glass Fabric at 15-p.s.i. Pressure

Property	*Tested at 77° F.*	*Tested at 500° F. after ½ hr. at 500° F.*
Flexural strength, p.s.i.	55,000	40,000
Flexural strength after 24 hr. immersion in water, p.s.i.	40,000	
Flexural modulus of elasticity, p.s.i.	3,500,000	3,250,000
Flexural modulus of elasticity after 24 hr. immersion in water	3,250,000	
Tensile strength, p.s.i.	40,000	35,000
Compressive strength, edgewise, p.s.i.	42,000	26,000
Impact strength, Izod, ft.-lb./in. of notch	13.5	
Specific gravity	1.5 to 1.8	
Resin content in cured laminate %	25 to 35	

* Reg. U. S. Pat. Off.
† This article covers results of a project performed for the Air Force on a contract supervised by the Materials Laboratory, Research Division, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio. The statements made represent the opinions of the author and not necessarily those of the Air Force.
†† Cincinnati Testing and Research Laboratories

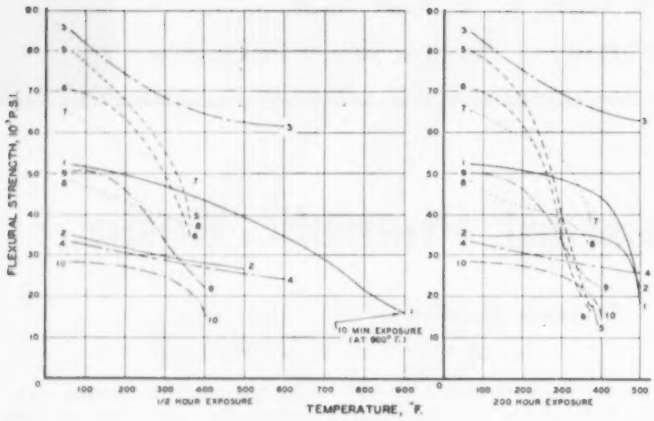

Fig. 1—Flexural properties of metals and CTL-91-LD 181 glass-fabric reinforced plastic. Curve 1: ⅛-in. CTL-91-LD, ultimate; curve 2: ½-in. CTL-91-LD, ultimate; curve 3: 18-8 stainless steel, ultimate; curve 4: 18-8 stainless steel, 0.2% offset; curve 5: 75 ST Al, ultimate; curve 6: 75 ST Al, 0.2% offset; curve 7: 24 ST Al, ultimate; curve 8: 24 ST Al, 0.2% offset; curve 9: Mg, ultimate; and curve 10: Mg, 0.2% offset

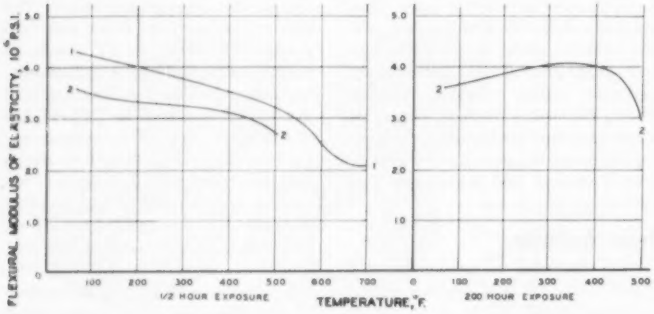

Fig. 2—Graphs showing flexural modulus of CTL-91-LD 181 glass-fabric reinforced plastic for different thicknesses. Curve 1: ⅛-in. CTL-91-LD, curve 2: ½-in. CTL-91-LD

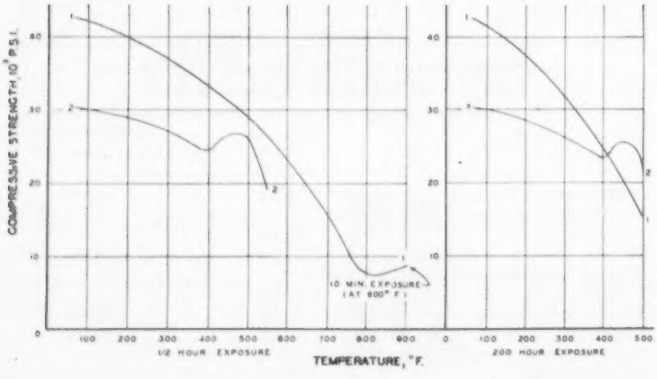

Fig. 3—Compressive strength of CTL-91-LD 181 glass-fabric reinforced plastic for thicknesses of ⅛ and ½ in., as indicated by curves 1 and 2, respectively

are obtained using somewhat increased pressures. Maximum properties for long-time temperature exposures are obtained at approximately 160 p.s.i. Figures 1 to 3, inclusive, show physical properties of 181 glass fabric laminate in two thicknesses at temperatures up to 900° F.

Properties

The various values found in laminates produced by high-pressure molding using standard pressing techniques are very nearly reproduced in laminates made by the vacuum bag molding method. This is undoubtedly due to the scavenging action of the vacuum in acting to remove the gases evolved during the final cure of the laminate.

The true value of this reinforced plastic material is most readily shown in Fig. 1 by direct comparison of its flexural ultimate and 0.2% off-set yield strength versus those of standard aircraft metals and annealed stainless steel. This is even more apparent when one considers the fact that the glass fabric reinforced phenolic material has a stress-strain diagram that is very nearly a straight line. Another important point which must be considered is the fact that the phenolic laminate has approximately the same specific gravity as magnesium, approximately half that of aluminum, and only about one fifth that of stainless steel.

Fabricating Techniques

The technique in handling and fabricating CTL-91-LD preimpregnated fabric differs somewhat from that for the wet lay-up polyesters, but is very similar to the standard dry lay-up technique with one major exception. The phenolic-impregnated fabric does not have a tack that enables a layer of fabric to be adhered to the previous one, but requires heat to seal one lamination upon the other. This does not mean that the entire lamination must be ironed down upon the previous one, but only that certain key points must be tacked with a sealing iron in order to maintain the physical conformation of the part to be manufactured.

In cases where intricate shapes are involved, CTL-91-LD 40/40/30 should be used. Slight warming of this material at approximately 200°

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F. in an oven will result in a temporary improvement in its draping behavior; however, it is recommended that most of the assembly be made either upon heated forms or under a bank of infra-red lamps, adjusted either through wattage reduction or distance from the part being fabricated to allow only moderate temperatures to exist at the point of assembly. Standard bag-molding techniques may be used with bleeder strips or hair felt as escape channels for volatile matter.

Ducting Sections

The fabrication of heat-resistant ducting is handled on standard tooling such as break-away plasters, aluminum collapsible forms, ceramic break-aways, and the like. The use of P.V.A. as a releasing agent and lagging medium is recommended. The same general rules will apply to CTL-91-LD as apply to polyester wet lay-ups, in that ducting sections which are not round will require additional bag-molding pressures in order to achieve full density. Either the bag-molded forms or the cellophane-lagged parts require a moderate temperature cure of 260 to 300° F. for about 1 hr., after which they can be removed from the forming mold and given a general postcure of 24 hr. at 250° F., 24 hr. at 300° F., and 24 hr. at 350° F. This suggested postcure cycle is intended to be a general guide and will cover most application.

It is possible, however, and in many cases desirable, to modify this long postcure cycle by using the same series of temperatures under shorter time conditions, or by other modifications which provide for moderate temperatures initially, increasing as time progresses so that the postcure time may be appreciably shortened.

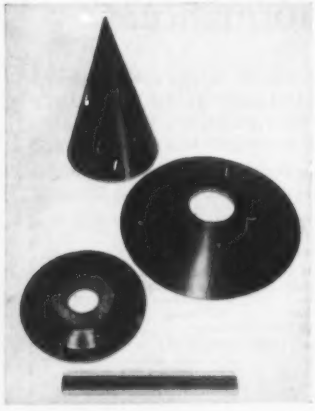


Fig. 4—Parts formed of glass-fabric phenolic plastic by high-pressure molding

Fig. 5—Parts molded of glass-fabric phenolic plastic, using cellophane lagging

Curing Procedures

There are three primary curing cycles normally used in the fabrication of flat sheets. The first or standard cycle uses the method normally found in high pressure laminating in that the material or build-up is placed between stainless steel or aluminum plates and loaded into a cold press. The press is allowed to heat to a temperature of approximately 315° F. After reaching this temperature, the pressure and heat are maintained for a minimum of 15 min.; then the platens are allowed to cool.

This curing cycle does not require postcure; however, in large size, thick panels a deterioration of physical properties is often found in the central portion of the panel.

A second curing method, which overcomes to a major degree the deterioration of properties observed in the standard cycle is the "kiss-type" cycle in which the material is loaded into a press previously heated to approximately 260° F. The press is allowed to close to contact pressure, and is maintained for a predetermined length of time, usually 1 to 2 min., after which the pressure is increased to the molding level which may range from 50 to 200 p.s.i. After approximately 8 to 10 min., depending upon the thickness of the panel to be fabricated, the piece is removed from the press hot and introduced into a postcuring oven for the final cure. The postcures used in this case are the same as those previously suggested.

A third curing cycle, primarily used for very thick panels (from ¼ to ½ in. and upward), uses a cold press into which the panel is placed, and pressure applied immediately. The temperature is raised to 260° F. maximum and is maintained at 260° F. for approximately ½ hour. Then the panel is removed hot and postcured as has been outlined previously.

The cycles and methods described have been successfully used on many parts.

Fabricators at first may meet with considerable difficulty in handling this material until the proper techniques are clearly understood and become standard practice. Figures 4 to 6, inclusive, show some of the unclassified applications for this new material.

In addition to the preimpregnated fabric, there is in pilot production, and under intensive development, a molding compound based on incorporation of the phenolic resin into a 60-end fibrous glass roving available either as a continuous filament or as various length staple fibers. These materials lend themselves to transfer and compression molding in standard equipment, and provide a molding having excellent physical properties coupled with desirable electrical characteristics under all standard conditions.

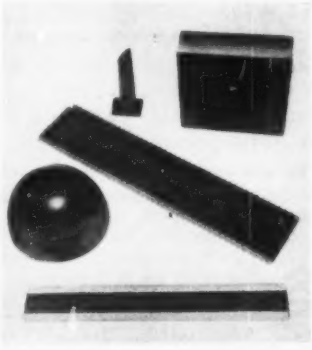
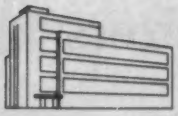


Fig. 6—Miscellaneous parts which have been molded of glass-fabric phenolic plastic



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Oxidative Decomposition of

Ether Ester Plasticizers

by B. W. Duke* and M. T. Gladstone*

THE desirable properties that ether ester plasticizers confer on vinyl resins under ordinary conditions of temperature (1,2)[1] led to an inquiry into their behavior at temperatures of the order of 150° C. As representative of this class of plasticizers, bis-2-butoxyethyl adipate was selected for the present investigation.

Distillation of this ester at 5 mm. pressure gave nothing below 200° C. However, on heating in a circulating air oven at 149° C., a marked weight loss occurred. For example, a 1-g. sample lost 47% in 1 hr. and 92% in 5 hours. This indicates that bis-2-butoxyethyl adipate is stable in the absence of air, but that it will yield volatile products when heated in the presence of air.

To accentuate this effect, oxygen was bubbled through the ester at 149° C. Under these conditions, butyric acid and peroxide were formed. This supports the statement of Reed (3) that butyl Cellosolve phthalate develops a strong butyric acid odor on aging. As can be seen in Table I, the acid number increased while the peroxide concentration decreased to a constant value.

In a similar study of the air oxidation of diesters, Atkins et al. (4) found that the greatest amounts of acidic products were formed from diesters containing ether-oxygen atoms.

Oxidation Effects

In pursuance of this effect, ethylene glycol monethyl ether (Cellosolve), ethylene glycol ethyl ether acetate (Cellosolve acetate), butyl alcohol, and butyl acetate were treated with oxygen in a similar manner. As shown in Table II, the acidity of those compounds containing an ether group increases during oxidation while the peroxide concentration remains essentially constant.

Butyl alcohol and butyl acetate, while run at a lower temperature than the Cellosolves, do not appear to react to any extent since no increase in peroxide was found. Work is being done on the effect of temperature.

Conclusions

From these results, we conclude that, as in the case of simple ethers, oxidation occurs at the ether group to yield peroxides which, on heating, decompose to products that are oxidized to acids. The formation of butyric acid from bis-2-butoxyethyl adipate indicates that oxidation takes place at one of the alpha carbon atoms.

This preliminary work suggests that a critical examination should be made of the effect of ether esters as plasticizers for vinyl polymers at elevated temperatures. Where plasticizers are readily oxidizable to acidic products, degradation of the polymer and serious loss of physical properties may result. Such effects have recently been reported by two investigators for the case of cellulose esters (5).

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(1) D. W. Elam, H. M. Preusser and R. L. Page, Modern Plastics *20*, 95 (May 1943).
(2) F. J. Tuttle and E. B. Kester, Modern Plastics *24*, 163 (Dec. 1946).
(3) M. C. Reed, J. Polymer Science *2*, 115 (1947).
(4) D. C. Atkins, Jr., H. R. Baker, C. M. Murphy, and W. A. Zisman, Ind. Eng. Chem. *39*, 491 (1947).
(5) G. C. DeCroes and J. W. Tamblyn, Modern Plastics *29*, 127 (Dec. 1952).

Table I—Effect of Oxygen on Bis-2-Butoxyethyl Adipate at 149° C.

Time	*Acid Number*	*Peroxide*
hr.		*ml. 0.1104N Thiosulfate*
0	0.5	0.8
1	9.0	0.4
2	16.0	0.4
3	23.0	0.3
4	29.5	0.35
5	34.0	0.35

Table II—Effect of Oxygen After 6 Hours

		Acid Number		*Peroxide (ml. 0.1104N Thiosulfate)*	
Compound	*Temp.*	*Initial*	*Final*	*Initial*	*Final*
	° C			*ml.*	*ml.*
Cellosolve	135	5	88	1.5	1.7
Cellosolve acetate	135	0	79	0.8	1.2
Butyl alcohol	117	0	0.5	0.1	0.1
Butyl acetate	117	0.5	0.5	0.05	0.1

* Technical Dept., Abrasive Div., Behr-Manning Corp.
[1] Numbers in parentheses link to references at end of article.

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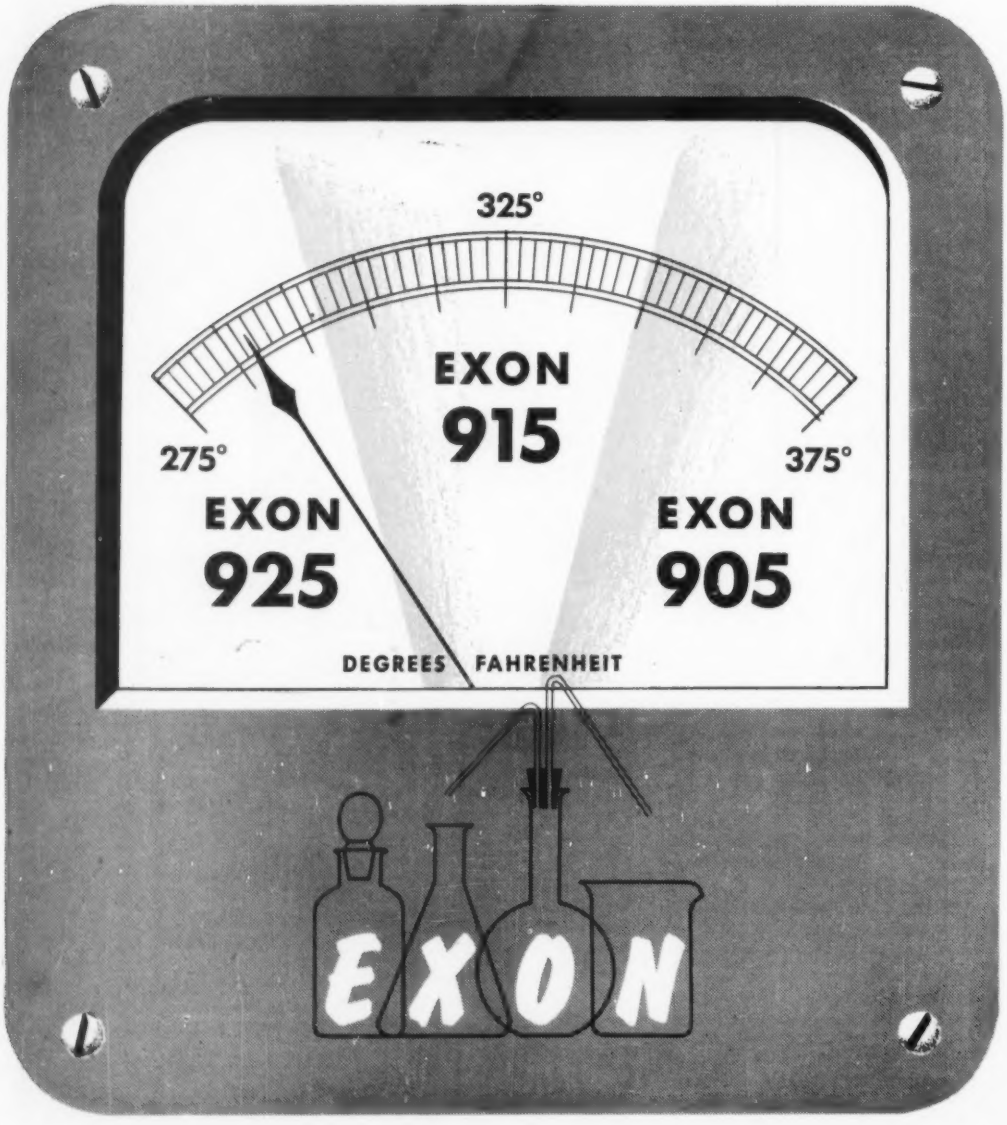

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Recent Developments with Epoxy Resins*

by J. E. Carey**

THIS paper is concerned primarily with epoxy resins developed for military applications. Epon resins have been submitted for qualification approval under three basic material specifications of the Government: 1) MIL Specification 7575, Laminating Resins; 2) USAF Specification 14164, Adhesives, Aircraft Structural, Metal to Metal; and 3) MIL Specification 16923 (Ships), Embedment and Casting Resins. A brief discussion of epoxy foams is also presented.

Since there are eight commercial grades of Epon resins available, varying from liquids to high melting solids, it is possible to use 1) wet lay-up laminating technique using 100% reactive liquid resins with proper curing agents, 2) dry lay-up laminating, which involves dissolving the solid resins and their curing agents in suitable solvents, preimpregnating of the reinforcement web with this solution, drying the impregnated web to remove solvent, and subsequent curing of this preimpregnated web after cutting to the desired laminating configuration, and 3) hot melt systems, which involve the use of one of the solid resins with proper choice of solid curing agents.

Table I—Physical Properties of a Laminate Made from 181-114 Glass Fabric and Epon 1001[a]

Tensile properties	
Ultimate strength, p.s.i.	55,300
Yield strength, p.s.i.	55,300
Modulus of elasticity, 10^6 p.s.i.	3.52
Compressive properties	
Ultimate strength, p.s.i.	70,200
Yield strength, p.s.i.	62,900
Modulus of elasticity, 10^6 p.s.i.	4.26
Flexural properties	
ORIGINAL	
Ultimate strength, p.s.i.	76,900
Yield strength, p.s.i.	69,600
Modulus of elasticity, 10^6 p.s.i.	3.72
30-DAY WET STRENGTH	
Ultimate strength, p.s.i.	71,300
Modulus of elasticity, 10^6 p.s.i.	4.69
60-DAY WET STRENGTH	
Ultimate strength, p.s.i.	64,600
Modulus of elasticity, 10^6 p.s.i.	3.7
160° F. STRENGTH	
Ultimate strength, p.s.i.	76,200
Modulus of elasticity, 10^6 p.s.i.	3.7
STRENGTH AFTER ACCELERATED SERVICE TEST (USAF 12049)	
Ultimate strength, p.s.i.	68,500
Modulus of elasticity, 10^6 p.s.i.	3.21
Izod impact strength, ft.-lb./in. of notch	17.4
Flammability, in./min. (max.)	1.62
Water absorption, 24 hr. immersion	
Gain in weight, % (max.)	0.03
Total water absorption, % (max.)	0.27
Rockwell hardness	M 111
Specific gravity	1.91
Resin content, %	28-33
Dielectric constant	
At 10^3 cycles	6.2
At 10^6 cycles	4.9
Dissipation factor	
At 10^3 cycles	0.06
At 10^6 cycles	0.02
Arc resistance, sec.	245

[a] The laminate contained 16 plies of glass fabric laminated parallel. Four parts of dicyandiamide catalyst were used per 100 parts of resin. The laminate was heated between platens for 5 min. at 330° F. and 0 p.s.i. pressure, then for 25 min. at 330° F. and 25 p.s.i. pressure. All tests were made in accordance with USAF Specification 7575, unless otherwise indicated.

Table II—Heat Aging Properties of Epon 128-114 Glass Cloth Laminates

Property	*Before Aging*	*After Aging at 350° F. for 10 hr.*
Surface resistivity, ohms	3.22×10^{13}	1.29×10^{14}
Arc resistance, sec.	245	245

Laminating Applications

Liquid Lay-Up—The wet lay-up system is attractive because of the possibilities which exist for low temperature cures with liquid amines. Although the maximum strength properties available from the epoxy resins are not developed during low temperature cures, it is possible to cure parts sufficiently well at low temperatures to allow release from their molds. Such parts can be aged at higher temperatures in ovens or under infra-red lights, with no supporting frames being required to produce their best properties.

This system has been employed in matched metal die molding and bag molding. It has also proven convenient in production of piping and tubing with glass yarn or roving where these materials are wound on mandrels and the liquid catalyzed resin is applied by brush, squeegee, or roll as the work progresses.

Probably the outstanding properties of the epoxy fibrous glass reinforced tubes are leak resistance at high pressure and superior shear properties. Burst presssure data on the pipes show that hoop strengths in the range of 70,000 p.s.i. can be obtained.[1]

Dry Lay-Up Laminating—The use of glass cloth preimpregnated with the solid epoxy resins and their appropriate curing agents has probably received the most widespread attention in our studies. Table I presents information on properties to be expected with 181-114 glass cloth and Epon resins using dicyandiamide as the curing agent.

The dry lay-up laminating system has stimulated the most interest in the electrical field, particularly in printed circuitry where it is possible to make an epoxy resin laminate and adhere copper foil to its surface in one press operation. This interest stems from the superior high temperature stability features offered by the epoxy resin as well as its adhesion to the copper foil. Some data indicating heat stability characteristics are presented in Table II.

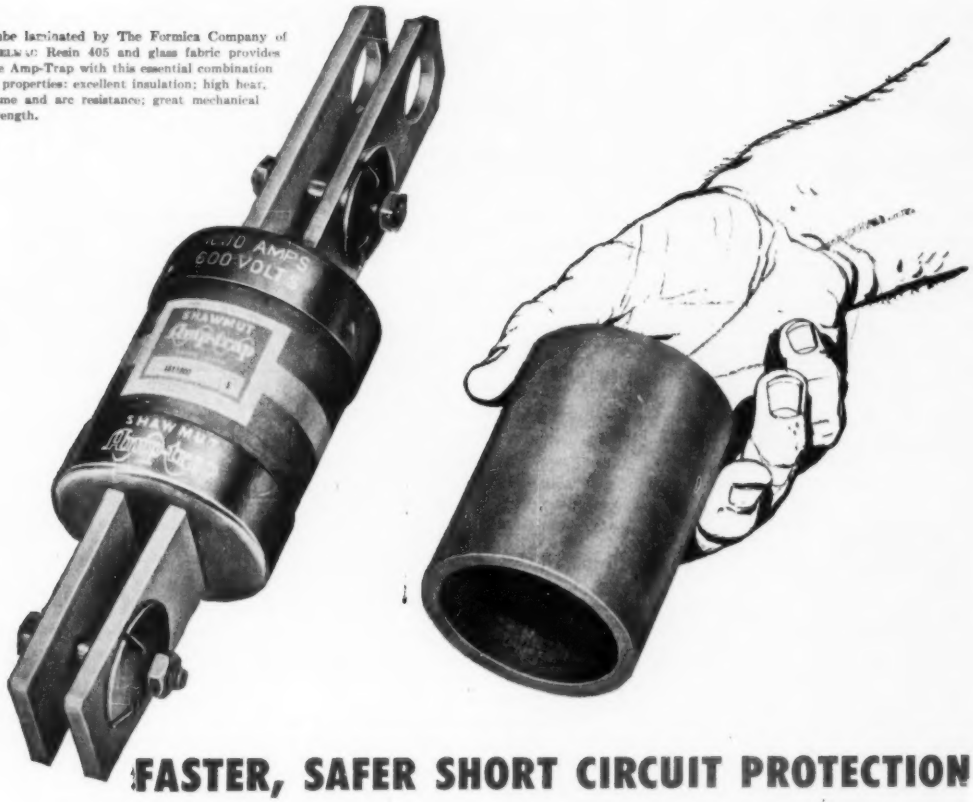
Although the Epon resins darken

* Condensed from a report presented at the 8th Annual Meeting of the Reinforced Plastics Division, Society of the Plastics Industry, Inc., February 18-20, 1953.

** Shell Chemical Corp.

[1] "Reinforced Plastic Tubing for Naval Ordnance," F. R. Barnett and H. B. Atkinson, Proceedings Seventh Annual Technical Session, Reinforced Plastics Division, Society of the Plastics Industry, April 9-11, 1952.

Tube laminated by The Formica Company of MELMAC Resin 405 and glass fabric provides the Amp-Trap with this essential combination of properties: excellent insulation; high heat, flame and arc resistance; great mechanical strength.



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at high temperature, they do not tend to crack and gas. Strength properties of present formulations are not high at elevated temperatures; however, work on high temperature strength formulations is under way. While our studies in this line are by no means complete, we are able to report some promising results which have been attained with an experimental resin. A brief summary of the available data is presented in Table III.

Hot Melt Application—The use of hot melt application of epoxy resins is generally felt to be less attractive from the mechanical application viewpoint than either liquid lay-up or solvent impregnation of the reinforcing web for dry lay-up. However, since this method can take advantage of some of the lower priced epoxy resins, it has been used. It will probably find its widest application in matched metal die work where unidirectional glass mat, roving, or random fiber preforms will first be placed into the mold cavity with subsequent dusting in of the catalyzed powder, and in tube and pipe manufacture from paper, glass, asbestos, or other fillers, utilizing heated mandrels and web preheating shoes in common use with other solid resins. Cure at temperatures in commonly experienced with phenolic resins in such fabrication.

Treatment of Laminating Mold Surfaces—It should be pointed out that severe sticking will occur if metal mold surfaces are not properly prepared. The use of Teflon or Kel-F sheeting as mold surfaces is satisfactory. Another solution to the problem appears to be the use of Dow Corning XC-135A or General Electric SM55 silicone emulsions or D.C. XC-130 or G.E. SR53 silicone varnishes. The emulsion is rubbed onto warm metal surface and wiped with a fresh cloth until the metal appears dry. This surface is then ready for use. The silicone varnish has been used to coat various porous mold surfaces such as plaster of paris, wood, and plastic where a continuous flow is necessary for adequate coverage of the porous substrate.

Properties of Epoxy Laminates

Probably the most significant difference between epoxy resin laminates and other resins in glass cloth laminates is that the epoxy resin laminates show considerably higher compressive strengths. We have also noted that tensile shear strengths are considerably higher. Tensile shear in this case was measured by pulling apart 1 in. wide test laminates which had been sliced slightly more than half way through on opposite sides at a ½-in. displacement to allow a ½-sq. in. shear area. The epoxy resins show about 4000 to 5000 p.s.i. tensile shear with 181-114 glass cloth using this method, whereas most polyester and diallyl phthalate laminates show about 1000 to 2000 p.s.i. shear strengths.

Several laminates have been prepared using 143-114 finish glass cloth and Epon 1001 cured with dicyandiamide under the same cure conditions as outlined in Table I. All plies of the cloth were in parallel orientation.

A brief summary of the strength data obtained with such laminates is presented in Table IV. This information points up the fact that fiber orientation has a great deal to do with the strength of plastic-glass laminates and probably should be given considerable attention by designers where it is possible to predict accurately the major stress which a laminate will receive in action.

Table III—Flexural Strengths of Epon X-12100 Impregnated Glass Cloth Laminates[a]

Aging conditions	*Flexural strength*		
	At room temp.	*At 300° F. after ½ hr.*	*At 500° F. after ½ hr.*
	p.s.i.	*p.s.i.*	*p.s.i.*
None	72,300	39,200	15,400
After 1 hr. at 400° F.	75,600	55,500	21,200
After 4 hr. at 400° F.	76,400	52,900	20,200

[a] Cured at 25 p.s.i. for 5 min. at 135° C. + 25 min. at 165° C. 6% dicyandiamide based on resin as catalyst.
Epon X-12100 is an experimental resin and is not generally available at this time.

Table IV—Properties of Laminates Made with Epon 1001 and 143-114 Glass Cloth Oriented Parallel

Flexural strength, p.s.i.	131,500
Flexural modulus of elasticity, p.s.i.	5,000,000
Compressive strength, p.s.i.	89,900
Compressive modulus of elasticity, p.s.i.	6,000,000
Tensile strength, p.s.i.	95,400
Tensile modulus of elasticity, p.s.i.	6,000,000

Laminates have been prepared in which all the fibers were oriented in one direction under some tension. It is reported that these laminates show moduli as high as 7,000,000 p.s.i. More information on this will probably be available at a later date. This work was undertaken because it was felt that the interweaving of glass fibers in production of glass cloth caused an appreciable amount of fiber breakage, and it was hoped that fiber abrasion could be minimized by the use of roving or yarn which might be cross banded to provide laminates having good strength in all directions.

Glass cloth which has a rather sinusoidal fiber orientation must stretch to some extent before the glass fiber begins to take the major share of the tension load. This inability to take load is not only reflected as lower modulus because of the take up movement required, but in stretching the glass tends to cut itself off by friction with transverse fibers from the warp, thus reducing its potential fatigue resistance. It is felt that by proper orientation of glass fiber or roving, a planned percentage of the fibers would go into tension under any given load or combination of loads, thus relieving

a range of 300 to 330° F. is generally used.

Tubes and large shapes have been prepared using the hot melt technique on hot mandrels wherein the powder is dusted into glass cloth or roving as the object is being rolled up.

There is sufficient flow time and low enough viscosity in the melted resin to allow complete purging of air provided the web is maintained under adequate tension during wind up. The absence of volatile products on cure eliminates the voids

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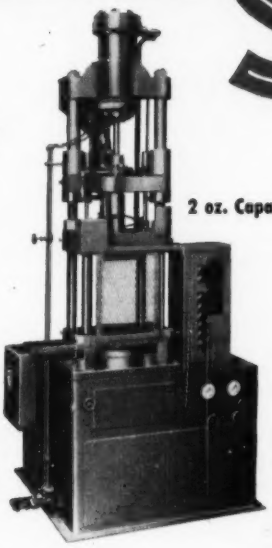

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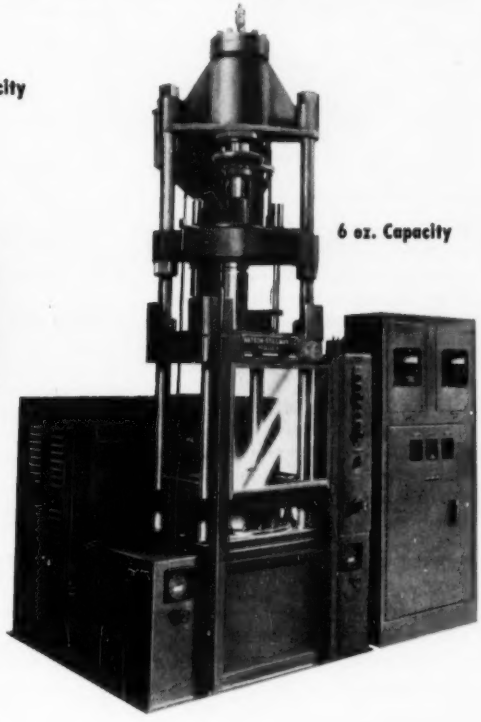

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Table V—Block Shear Bond Strengths with Epon Adhesive VI

Material[a]	*Block Shear, Average*
	p.s.i.
Steel	5100
Lucite	800[b]
Aluminum	6400
Bakelite phenolic	3900[b]
Steel to Epon fibrous glass laminate	5100
Steel to aluminum	6400
Steel to Bakelite phenolic	3700[b]
Valve bronze (composition M)	5000
Copper-nickel (70/30)	5500
Copper	3500

[a] Adhesion between two pieces of same material unless otherwise stated
[b] Plastic failed

the resin of the necessity of taking up initial loads before the fiber becomes effective. With such a laminate the resin would be used only in the role of an adhesive to assure that the fibers are properly oriented and that they remain in a non-porous condition.

The epoxy resins show good wetting of glass fibers and low shrinkage on cure. Both properties are felt to be essential to good adhesion and low stress formation in the resin, which would be essential requirements of a resin for bonding and sealing the oriented laminate discussed above.

Epoxy Adhesives

Data have been presented previously on Epon Adhesive VI, which was primarily designed as an aluminum-to-aluminum bond.[2] Block shear values on the use of Epon Adhesive VI with various other materials are given in Table V.

Rubber-to-metal and rubber-to-plastic joints are feasible with epoxy resins. It is necessary to cyclize the rubber before bonding with the epoxy resins.

Information on a new Epon Adhesive VIII, which has been submitted to the Air Force for approval under USAF Specification 14164, is presented in Table VI.

Casting and Potting Resin

Data on Epon 828 cured with Epon Catalyst D or piperidine are given in Table VII. MIL Specification 16923 gives information on thermal shock and impact test methods.

Epoxy resin foams have been prepared using Celogen[3] and Unicel[4] as foaming agents. The technique involves initiation of cure of the resin and blowing agent mixture with liquid amines, which creates enough exothermic heat to "kick off" the blowing agent.

From this point generation of the gases from the blowing agent and gelation of resin are in competition to form a suitable foam.

The technique of foaming large sections is under development. The epoxy foams have good chemical and heat resistance and compressive strength.

[2] "General Properties and Applications of Epoxy Resins," by J. E. Carey and T. G. Nock, Proceedings, Seventh Annual Technical Session, Reinforced Plastics Div., S.P.I., April 9-11, 1952.

[3] Naugatuck Chemical, Div. of U. S. Rubber Co.
[4] E. I. du Pont de Nemours and Co., Inc.

Table VI—Properties of Bond Joints Made with 24 ST Aluminum and Epon Adhesives VI and VIII

Property	*Requirements of USAF-14164*	*Epon Adhesive VIII (Cured 90 min. at 200 F. with Curing Agent A)*	*Epon Adhesive VI (Curing Agent A) Cured 7 days at 77° F.*	*Epon Adhesive VI (Curing Agent A) Cured 45 min. at 200° F.*
Tensile shear				
At 77° F., p.s.i.	2500	3200	1800	3800
At 180° F., p.s.i.	1250	3100	400	1250
At 250° F., p.s.i.		1200		1250
At 300° F., p.s.i.		400		
At —70° F., p.s.i.	2500	2600	800	2700
Long-time tensile shear				
200 hr. at 77° F., p.s.i.	1600	3100		
200 hr. at 180° F. p.s.i.	800	2200		
Tensile shear at 77° F. after				
30 days in tap water, p.s.i.	2000	4200	1800	3500
7 days in ethylene glycol, p.s.i.	2000	3000	1800	3700
7 days in anti-icing fluid (AN-F-13), p.s.i.	2000	3100	1800	3800
7 days in hydraulic fluid (AN-O-366), p.s.i.	2000	4000	1800	4000
7 days in hydrocarbon (AN-F-42), p.s.i.	2000	3700	1800	3800
30 days in salt spray (QQ-M-151), p.s.i.	2000	3100	1800	3800
Impact strength at 77° F., ft.-lb.	10	14	15	15
Bend strength, lb.	150	175		200

Table VII—Physical and Chemical Properties of Epon 828 Cured with Catalyst D or Piperidine

Specific gravity (68°/68° F.)	1.19
Barcol hardness	36
Thermal coefficient of expansion, linear (ASTM D696-44), per °C.	6.7×10^{-5}
Coefficient of thermal conductivity	
cal./sec./cm.²/°C./cm.	4.8×10^{-4}
Btu/sec./ft.²/°F./in.	3.9×10^{-4}
Water absorption (ASTM D570-42)	
24 hr., %	0.07
1 week, %	0.20
1 month, %	0.47
Water vapor transmission (10 mil thick film at 77° F., 0% rel. hum. one side, 50% rel. hum. on other side), g/sq. meter/24 hr.	1.0
Stability to chemicals, gain in weight (ASTM D543-43)	
After 1 mo. in ethyl alcohol, %	0.75
After 1 mo. in benzene, %	0.26
Aging: weight loss of ⅛ in. thick sections after conditioning at 50% rel. hum. and 77° F.	
After 18 hr. at 185° F. %	0.26
After 16 hr. at 393° F. %	1.05
Compressive strength (ASTM D695-49T), p.s.i.	18,400
Compression at ultimate, %	5.5
Flexural strength (ASTM D790-49T), p.s.i.	21,000
Flexural modulus of elasticity, 10^5 p.s.i.	0.54
Izod impact strength (ASTM D256-47T), ft.-lb./in. of notch	0.36
Tensile properties (ASTM D638-49T)	
At 77° F.	
Tensile strength, p.s.i.	8000
Elongation, %	1.6
Modulus of elasticity, 10^5 p.s.i.	0.66
At 130° F.	
Tensile strength, p.s.i.	8800
Elongation, %	1.5
Modulus of elasticity, 10^5 p.s.i.	0.53
At —70° F.	
Tensile strength, p.s.i.	9000
Elongation, %	1.7
Modulus of elasticity, 10^5 p.s.i.	0.65

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

Materials

MIXED ETHYLCELLULOSE-BUTYLHYDROXYETHYLCELLULOSE FILMS. H. C. Haas, L. C. Farney, and C. Valle, Jr. Ind. Eng. Chem. *45*, 564-6 (Mar. 1953). Ethers of hydroxyethylcellulose are compatible with ethylcellulose. A butyl ether containing 1.5 combined ethylene oxide and 2.0 to 2.1 butyl groups per anhydroglucose unit is compatible with ethylcellulose in all proportions. As systems of miscible polymer pairs are in general rare, a study of blends of these two materials was made. Perfectly clear mixed films of these two polymers are obtained by casting from a mutual solvent—in this case, benzene. Stress elongation measurements on these films show a smooth transition in properties from pure ethylcellulose to pure butylhydroxyethylcellulose. Film properties appear to be simple functions of film composition, the yield stress, tensile strength, and softening point, decreasing in a linear fashion with butylhydroxyethylcellulose content. A plot of brittle temperature versus film composition has a maximum. As the butyl ether is a relatively low modulus material of high extensibility, blending this polymer with ethylcellulose permits modification of the mechanical properties of the latter to a considerable extent. For certain applications, butylhydroxyethylcellulose may be used as a polymeric plasticizer for ethylcellulose.

PHENOL-, UREA-, AND MELAMINE-FORMALDEHYDE PLASTICS. P. O. Powers, Ind. Eng. Chem. *45*, 1063-66 (May 1953). Recent developments in phenol-, urea-, and melamine-formaldehyde plastics are reviewed.

NEW HIGHLY ELASTIC MATERIALS: VULKOLLAN. E. Müller, O. Bayer, S. Petersen, H. Piepenbrink, F. Schmidt, and E. Weinbrenner. Angewandte Chemie *64*, 523-31 (Oct. 1952). Linear polyesters of adipic acid and simple glycols can be extended and converted simultaneously into so-called "isocyanate polyesters" with isocyanate groups at their ends by an excess of diisocyanates, in particular naphthalene-1.5-diisocyanate. Agents such as glycols, aminoalcohols, diamines, and other bifunctional compounds are described. The mechanism of cross-linking for each individual case is discussed. The chemical nature of the cross-linking agent has a considerable influence on the properties of the product. The methods described open up new ways of processing, and, in particular, a solvent-free casting of Vulkollan has become possible.

POLYMERIC PLASTICIZERS. J. E. Koroly and E. M. Beavers. Ind. Eng. Chem. *45*, 1060-63 (May 1953). Polyester-type plasticizers with laurate terminal groups are described. Synthesis and properties are reported.

EFFECTS OF THE IONIZABLE COMPONENTS IN CAST PHENOPLASTS. T. G. Harris and H. A. Neville. J. Polymer Sci. *10*, 19-28 (Jan. 1953). The various stages employed in the production of a phenol-formaldehyde cast resin are discussed. It is assumed that the chains formed during the condensation stage undergo a rearrangement upon acidification to yield roughly spherical stabilized micelles. These micelles are concentrated by dehydration until coalescence begins. At this point the chains again rearrange and the resin becomes the continuous phase. Pronounced changes in the properties of the system are observed at this critical point. The effects produced by undercondensation, overcondensation, overdehydration, etc., are mentioned briefly. The ionizable components, by determining the interfacial pH during the curing stage, are shown to be directly related to the rate of cure, stability, color, light transmissibility, etc., of the cured casting. Transparent castings are expected only when an ionizable component of the proper refractive powers is oriented at the interface. An examination of the immediately available data provides a lead to the future changes that can be expected as aging progresses.

POLYAMIDES AND POLYURETHANES AS FINISHING AGENTS FOR PLASTICIZED POLYVINYL CHLORIDE. G. Beck. Kunststoffe *43*, 107-109 (Mar. 1953). Surface shortcomings of plasticized polyvinyl chloride, such as plasticizer migration, extraction of plasticizer by mineral or vegetable oils, the cold touch in winter and the clamminess in summer are improved by the application of a coating. A primer of polyurethanes is applied to the surface. The isocyanate groups protruding from the surface react with the imide groups of the final coating of polyamides or polyurethanes. This final coating is linked with the polyvinyl chloride by main valence bonds via the primer and will not peel off.

CROSS-LINKING REACTIONS WITH ESTERS OF ORTHO-TITANIUM ACID AND OTHER METAL ALCOHOLATES. F. Schmidt. Angewandte Chemie *64*, 536-38 (Oct. 1952). The capability of alcoholates of titanium, aluminium, and other metals to form complex compounds and to undergo an ester interchange with the OH groups of macromolecular organic polyhydroxy compounds is described. The use of stabilized alcoholates retards the very rapid formation of complex compounds. The incorporation of such stabilized metal alcoholates into organic polyhydroxy compounds yields cross-linked macromolecular plastics.

Molding and Fabricating

RHEOLOGY OF LUBRICATED POLYTETRAFLUOROETHYLENE COMPOSITIONS: EQUIPMENT AND OPERATING VARIABLES. E. E. Lewis and C. M. Winchester. Ind. Eng. Chem. *45*, 1123-27 (May 1953). The mechanism of lubricated paste extrusion of polytetrafluoroethylene appears to be a combination of permanent and elastic deformation in the region just before the orifice of the die. The amount of total deformation of the polymer in a given paste depends on the die design, the polymer temperature, and in some cases the flow rate. As a result of permanent or plastic

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LEATHER: BECKOSOL alkyd resins (for leather finishes); PLYOPHEN resorcinol-formaldehyde resins, SUPER-BECKACITE pure phenolic resins, SYNTHE-COPAL ester gums (for leather adhesives).

LINOLEUM: BECKOSOL alkyd resins and PENTACITE pentaerythritol resins (for linoleum coatings); RCI inorganic chemical pigment colors.

PAINTS, VARNISHES AND LACQUERS: BECKACITE (1) fumaric, (2) maleic and (3) modified phenolic resins; BECKAMINE urea-formaldehyde resins; BECKOLIN synthetic oils; BECKOPOL modified phenolic resins; BECKOSOL (1) phenolated, (2) phthalic-free, (3) rosin modified, (4) pure drying and (5) pure non-drying alkyd resins; KOPOL processed Congo copals; PENTACITE pentaerythritol resins; STYRESOL styrenated alkyd resins; SUPER-BECKACITE pure phenolic resins; SYNTHE-COPAL ester gums; WALLKYD pure drying alkyd resins (for alkyd flat wall vehicles); WALLPOL vinyl-type copolymer latex emulsion (for latex flat wall coatings); RCI inorganic chemical pigment colors.

PAPER: BECKAMINE urea-formaldehyde resins (for adding wet strength, improving the wet rub of starch-clay coatings, and waterproofing starch adhesives); RCI inorganic chemical pigment colors (for paper coloring); STYRESOL styrenated alkyd resins (for paper coating).

PRINTING INKS: BECKACITE fumaric, maleic and modified phenolic resins; BECKOLIN synthetic oils; BECKOPOL modified phenolic resins; RCI inorganic chemical pigment colors.

TYPEWRITER RIBBONS: RCI inorganic chemical pigment colors.

WAXES AND POLISHES: BECKACITE modified maleic resins; SUPER-BECKACITE pure phenolic resins; SYNTHE-COPAL ester gums.

RCI

deformation, the spherical polymer particles formed during polymerization are transformed into long fibers. Relaxation or recovery from elastic deformation tends to occur both in the land and after extrusion. The amount of relaxation after extrusion, as evidenced by the degree of swelling of the beading, depends on the amount of elastic deformation of the polymer, the fluidity of the paste, and the residence time of the polymer in the land, which in turn is a function of land length and flow rate.

TOMORROW'S ROLL SURFACE TEMPERATURE CONTROL AND NEW PRESS HEATING SYSTEMS. P. L. Geiringer. SPE J. *9*, 32-5, 51 (Feb. 1953). Methods for heating and controlling the surface temperatures of plastics processing equipment are described.

Applications

POLYSTYRENE HONEYCOMBS. W. Lacis. Kunststoffe *43*, 109-110 (Mar. 1953). To increase the production of honey in Germany, injection molded polystyrene honeycomb sheets are replacing the honeycombs made of beeswax which is short in supply. After the honey is harvested the polystyrene honeycombs are washed and reused. They are sterile, odorless, and tasteless, and do not carry diseases harmful to the bees.

PLASTICS PIPING FOR LIQUID HANDLING. Brit. Plastics *26*, 51-55 (Feb. 1953). The production of plastic piping for the handling and transmission of liquids in Great Britain is discussed. Interest is centered mainly on polyethylene and polyvinyl chloride. Smaller quantity materials are also discussed. Polyethylene is being used extensively for cold water piping. Costs of installation and the base price are competitive with metals. Methods of handling, joining, and fabrication are described. All polyethylene pipe for water usage is pigmented black to improve ultraviolet resistance and aging characteristics. Other applications considered are drainage pipe, chemical piping, and blood transfusion tubing. Rigid and non-rigid polyvinyl chloride are compared. Limits on usage of rigid material are pointed out with respect to impact strength. Cellulose acetate butyrate presently has limited use because of import costs but its transparency makes it very desirable in certain applications. The use of thermosetting and reinforced polyester piping is growing. A standard for polyethylene piping is being prepared.

VINYL FLOOR COVERINGS. R. K. Petry. SPE J. *9*, 36-7, 60 (Feb. 1953). The types and advantages of floor coverings made of vinyl plastics are described.

USE OF PLASTICS IN THE CONSTRUCTION OF APPARATUS AND PIPELINES. H. Saechtling. Chemie-Ingenieur-Technik *24*, 537-44 (Oct. 1952). The application of plastics in the construction of chemical apparatus depends on the mechanical and thermal properties, and in particular on the chemical resistance. The most important plastics, both thermosetting and thermoplastic are compared with a view to their possible uses as materials in the construction of chemical apparatus and pipelines. The application in the chemical industry is illustrated by means of examples.

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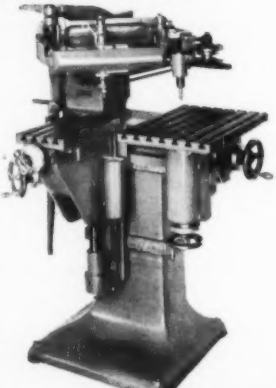
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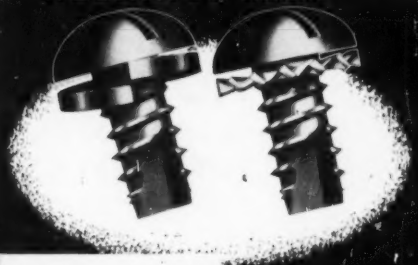

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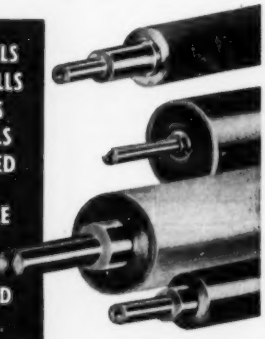

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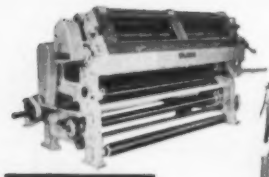

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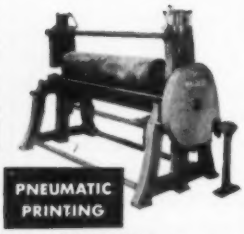

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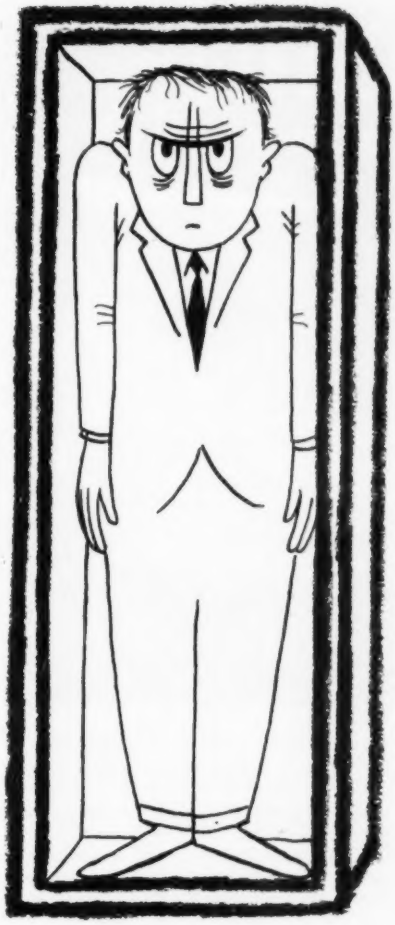
operation packaging dried fruits. This is the first time a fully automatic machine has been able to bag-package non-free-flowing solids. The economics of the industry have shown film packaging to be popular and to stimulate sales. By the old method 14 workers put out 35 filled bags per minute. The new machine requires only 4 workers and produces 44 bags per minute. Printed film in rolls, on the new machine, is formed into a tube and sealed. The tube is control-filled by an automatic weighing device accurate to ½ unit of fruit overweight. The bag is automatically sealed. Hydraulic operation is used almost exclusively to give a lighter machine and quieter operation. With this machine the cost of a flexible transparent package is much less than the standard carton.

Properties

COLLOIDAL AND SURFACE PHENOMENA. G. Broughton. Ind. Eng. Chem. 45, 912-32 (May 1953). The literature on colloidal and surface phenomena is reviewed. The extensive range of recent publications concerned with the science of matter in the boundary state is evidence of the increasing importance of this field. New methods or improved old techniques for the study of colloidal solutions include extended use of the electron microscope, electrophoresis, viscosity, radioactive tracers, and ultrasonics. Studies of surface films throw light on the dependence of contact angles and frictional phenomena on adsorbed films. There were many investigations of nuclear phenomena, recognizing their fundamental importance in many chemical engineering applications; the seriousness of air pollution problems led to increased interest in aerosols. The behavior of macromolecules in solution, micellar colloids, and polyelectrolytes continued to attract wide attention. 915 references.

EFFECTS OF VIBRATION ON PHENOLIC FOAMS. H. J. Stark. A.S.T.M. Bulletin No. 189, 44-8 (Apr. 1953). The phenolic foams described in this report, with or without skins, when subjected to vibration of specified amplitude and frequency and given freedom to move inside a closed container, will lose volume, shake down, and powder. The degree of volume loss is somewhat variable depending



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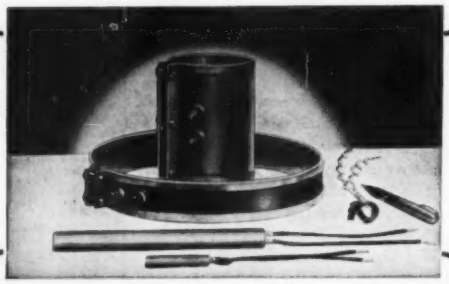

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upon the particular foam examined. The utilization of phenolic foam in application where it is subject to vibration requires that the material be bonded in place or otherwise be firmly retained on all sides so that it is not free to move; otherwise volume loss can be expected. Phenolic foams that exhibit cracks in the skin or body of the material where the skin has been removed are more susceptible to volume loss and shakedown than those that do not exhibit these post-cure shrinkage cracks.

FLOW OF GASES THROUGH PLASTIC MEMBRANES. D. W. Brubaker and K. Kammermeyer. Ind. Eng. Chem. *45*, 1148-52 (May 1953). Permeabilities were obtained for a variety of gas-film combinations, including experimental and commercial films and a large number of commercially important compounds. The effect of temperature upon the permeation of gases through plastic membranes is not readily predictable, although usually a straight line is obtained when the logarithm of the permeability constant is plotted against the reciprocal of the absolute temperature. Whenever possible permeability data should be presented for at least three temperatures. For polyethylene film, the apparent straight-line relationship seems to hold from —70° to +50° C. for nitrogen, hydrogen, and helium gas. The rate of gas flow decreases proportionally as the thickness is increased. Similarly, the gas rate of flow increases proportionally with increases in the partial pressure difference. Thus, neither the thickness nor the pressure differential has an effect on the permeability constant. A rather wide range of thicknesses was used, as well as diversified types of membranes. There seems to be no apparent correlation between the nominal molecular weight of the membrane and the rate of gas permeation. A wide range of permeability constants was found, but no correlation could be established. The effect of plasticizer is, in general, that of increasing the rate of gas permeation. The presence of plasticizer may also cause a change in the order of gas permeation. The higher the temperature, the less the plasticizer content necessary for the change to occur. The degree of change of permeation is also affected by the nature of the gas. All data available so far indicate the desirability of undertaking extensive studies on the effect of plasticizers on gas permeability. There appears to be no apparent correlation between the permeability constant and the type of plastic used.

RESISTENCE OF PLASTICS TO CORROSION. K. Eifflaender. Chemie-Ingenieur-Technik *24*, 555-63 (Oct. 1952). During recent years the use of plastics in the construction of apparatus and in the chemical industry has continuously gained importance. The engineer should have a good knowledge of the resistance of these materials to chemicals. The various kinds of exposure to chemicals are classified and the corrosion resistance of the most important plastics which are used in the apparatus is described.

TEMPERATURE-HUMIDITY EVALUATION OF PLASTICS. A. Brent. Elec. Manuf. *51*, 105-11 (May 1953). Special cycling tests, used with standard A.S.T.M. test procedures, provide data for appraisal of electrical performance under severe environmental conditions. A 24-hr. cycle consists of 17 hr. at 160° F. and 95 to 100% relative humidity and 4 hr. at 14° F.,

DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

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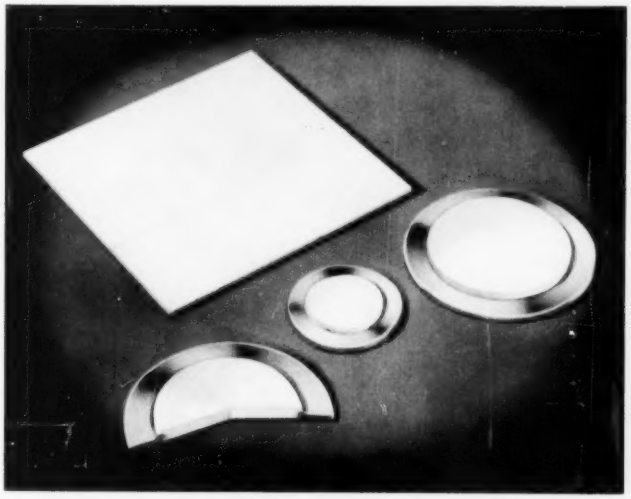
Rugged Diaphragm of Kel-F Pumps Abrasive, Corrosive Slurries at Uniform Rates... without Clogging

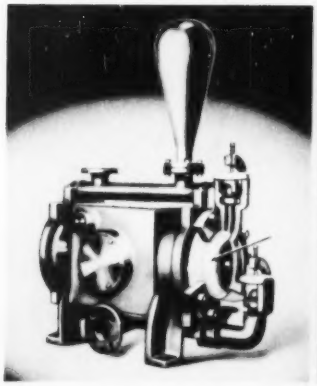


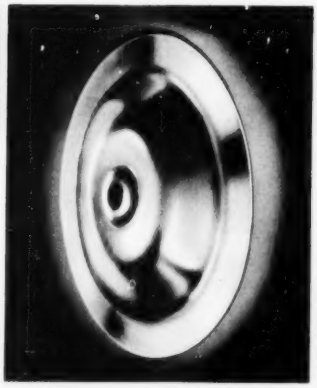
This widely-used positive-displacement pump now employs a diaphragm of plasticized Kel-F polymer, enabling it to handle corrosive and abrasive suspensions which previously made short work of rubber and other diaphragm materials. The reasons for specifying Kel-F polymer as the diaphragm material are many. The plastic's absolute chemical inertness allows the use of a *single* pump for many chemical pumping jobs. The high abrasion resistance and flexural strength of Kel-F permit the pump to work through countless flexing cycles in corrosive and abrasive mediums without erosion of the diaphragm. The plastic's remarkable "memory" prevents the diaphragm from permanently stretching out of shape thus maintaining constant pumping volume and capacity.

This special slurry pump is manufactured by T. Shriver and Company, pump specialists of Harrison, N. J. The company fabricates the diaphragm from sheets of plasticized Kel-F polymer supplied by the Reiss Manufacturing Company of New York, N. Y. Special thermal stabilization of the material, imparts unusual service life.

Refer to Report C-108

New Filter of Porous Kel-F Allows Rapid Filtration of Fuming Nitric Acid, Corrosives without Contamination . . . Resists Tearing





The samples of chemical filters shown above can filter corrosives such as fuming nitric acid, aqua regia, alkalis and peroxides. And no matter what the corrosive is, it will not affect the porous plastic filter... nor will the filter contaminate the filtrate! It allows water flow at rates up to 100 gals./min. per square foot of filter area at a 10# pressure differential. Made of Kel-F trifluorochloroethylene polymer, it will not only filter corrosive materials safely and efficiently, but will stand a lot of physical abuse as well. A tensile strength of 900 psi and an elasticity modulus of 18,000 psi gives this material excellent tear resistance and sufficient pliability for a host of commercial filtering applications.

The chemical filters of porous Kel-F illustrated, are produced by the Porous Plastic Filter Company (a Pall Filtration Industries company) of Glen Cove, N. Y. Pore size is maintained at 15 microns. Disc filters and corrugated high-area units arranged for pipe line use as well as square stock sheets are currently available. All filters may be obtained in $\frac{1}{16}$" or $\frac{1}{4}$" thicknesses, with the disc filters ranging from $\frac{1}{2}$" to 12" in diameter, the sheets up to 24" x 24".

The versatility of Kel-F polymer properties permitted the development of an inert filter that not only resists chemical destruction but physical and thermal damage as well.

Refer to Report C-105

(SEE REVERSE SIDE)

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DESIGN and PRODUCTION NEWS

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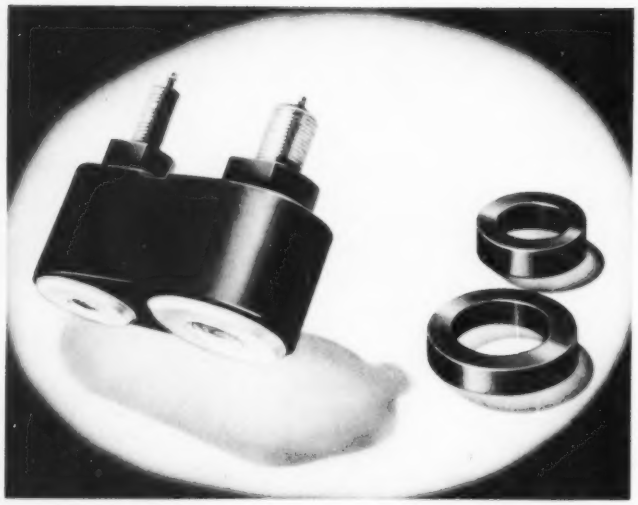

Antennae Insulator-Mount of Kel-F Blocks RF Leakage . . . Takes High Wind Loads . . . Eliminates Fungus Losses

Found to be the material with the lowest RF loss, Kel-F trifluorochloroethylene polymer, with its toughness and dimensional stability, enables the antennae insulator mount shown above to stand up under high wind and shock loads and other physical abuse that caused other mounts to fail after a short time.

The dual insulator-mount and two insulating washers, designed to hold a "short" and "long" antenna, are injection-molded and used by the JFD Electronics Corporation of Brooklyn, N. Y. in portable military radio receivers. The complex antennae insulator, together with insulating washers, are produced by standard procedures in a single "shot," using multiple-cavity molds.

Kel-F trifluorochloroethylene polymer was specified for this critical application on the basis of its unique combination of desirable properties. The high electrical insulation resistance of Kel-F at high and low temperatures is further enhanced by the plastic's zero water absorption and non-wettability. Since Kel-F remains unaffected by sustained exposure to moisture, surface electrical losses are eliminated. The non-wetting and non-stick properties of this fluorocarbon plastic prevent the formation or adhesion of conductive fungus growths. Kel-F polymer also extends trouble-free operation of the part by eliminating corrosion and loosening of metal inserts due to release of plasticizers.

Refer to Report E-106

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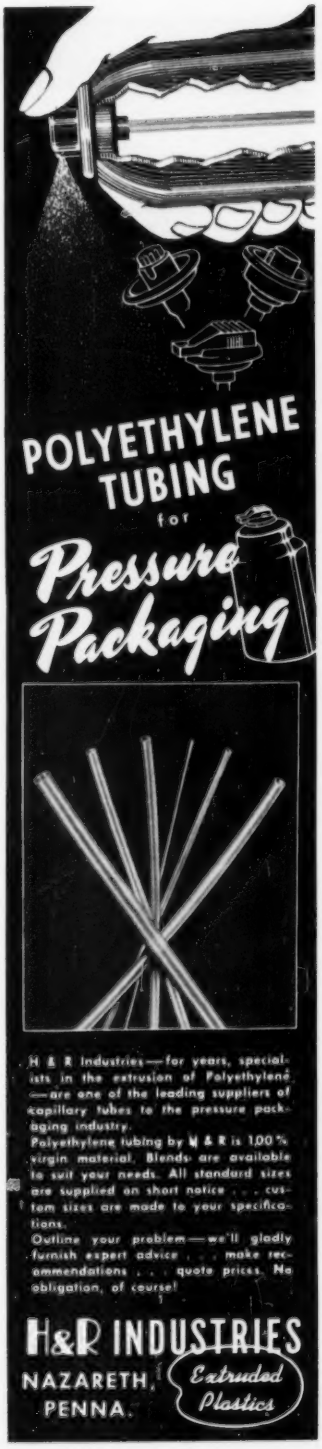
with uncontrolled relative humidity. A test consists of ten 24-hr. cycles. Results are given for insulation resistance, dielectric strength, dielectric constant, and power factor for five laminated and seven molded electrical grade plastics. Insulation resistance is measured daily throughout the test. Plots of resistance versus time are given. Other properties are measured only before and after the test. The cycle operation used was found to have a greater deteriorating effect on electrical properties than complete immersion in water for 48 hr. at 50° C.

CELLULOSE ACETATE BUTYRATE. E. E. Halls. Plastics (London) *18*, 7-9 and 38-39 (Jan. and Feb. 1953). This is the second and third in a series of articles comparing cellulose acetate and cellulose acetate butyrate, in this case in the form of sheets, tubes, and film. The data indicate that cellulose acetate butyrate sheet is superior to cellulose acetate sheet in resistance to mild heat or dry conditions, under damp or wet conditions, and from the electrical point of view. Cellulose acetate butyrate sheet also satisfactorily withstands the severe hot and wet conditions whereas cellulose acetate fails; it behaves very much better under both wet immersion and dry heat conditions, and where a combination of high humidity and moderate heat is imposed. Data presented for tubing show a similar superiority of cellulose acetate butyrate over cellulose acetate. In the comparison of the properties of cellulose acetate butyrate and cellulose acetate in film form, tables of data are presented for bursting strength, and changes in weight and dimensions under water immersion conditions at 25° C., under continuous dry heat at 60° C., and under conditions of mild humidity. As a whole, the cellulose acetate butyrates give better performance on the stability tests than do the cellulose acetates, without sacrificing strength or ductility.

COATINGS (ANNUAL REVIEW OF ANALYTICAL CHEMISTRY). R. W. Stafford and J. F. Shay. Analytical Chem. 25, 8-11 (Jan. 1953). This review covers chemical and physical analytical methods applicable to organic high polymers and associated oils, waxes, pigments, and plasticizers, as disclosed in the literature during the past year. The scope of materials includes lacquers, varnishes, and paints as well as organic finishes for and on paper, textiles, leather, and metals. General analytical methods are discussed first. Analysis of organic coatings with respect to their component parts are then treated. An auxiliary bibliography of related material is appended in addition to the cited literature.

ANALYSIS OF PHTHALIC ACID ESTERS OF CELLULOSE AND OF POLYVINYL ALCOHOL. C. J. Malm, L. G. Genung, and W. Kuchmy. Analytical Chem. 25, 245-49 (Feb. 1953). Methods for determining the composition of phthalic acid esters of cellulose and of polyvinyl alcohol are discussed. These materials are finding commercial uses as films and coatings. Phthalyl content can be measured by a titration procedure or by ultraviolet absorption at 275 mμ. Saponification values are discussed and three methods for determining saponification values are presented. Methods for determination of free phthalic acid by three procedures—the composition of mixed esters, the presence of salts, and the determination of hydroxyl present—are also discussed. Equations and methods are given for determining the degree of substitution for acetyl, hydroxyl, and phthalyl groups for the various esters. Tables give typical results.

MODIFICATIONS OF ATLAS TWIN-ARC WEATHER-OMETER. J. W. Tamblyn and G. M. Armstrong. Analytical Chem. 25, 460-5 (Mar. 1953). The Weather-Ometer utilizing borosilicate glass-enclosed arcs was modified by the addition of eight 20-watt Westinghouse fluorescent sun lamps. By this means, the short ultra-violet was increased to make the total ultra-violet distribution more closely resemble that of sunlight. Weathering of plastic specimens was evaluated by observation of color, gloss, haze, and cracking and quantitatively by measurements of weight, flexural strength, brittleness, and inherent viscosity. Typical results are given using the modified Weather-Ometer with cellulose acetate butyrate. The data indicate that the modified Weather-Ometer gives results that agree much better than those obtained with the unmodified machine with those observed on exposure, especially for plastic formulations which are sensitive to the low wavelengths of the sunlight.



U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

POLYESTER. T. F. Anderson (to Libbey-Owens-Ford). U.S. 2,632,-752-3, Mar. 24. Polyester resins.

HETEROPOLYMERS. R. H. Bunnell (to Libbey-Owens-Ford). U.S. 2-,632,755, Mar. 24. Silicon-containing heteropolymers.

POLYMERS. D. Harman and A. R. Stiles (to Shell). U.S. 2,632,756, Mar. 24. Polymers of olefinic tetraesters of bis(phosphonoalkyl) ethers.

RESINS. D. D. Reynolds and W. O. Kenyon (to Eastman Kodak). U.S. 2,632,757, Mar. 24. N-substituted polyvinyl amines.

POLYMERIZATION. A. Brothman. U.S. 2,632,758, Mar. 24. Polymerization of methyl methacrylate with mixture of benzoyl and tertiary-butyl hydroperoxide.

BONDING POLYETHYLENE. W. H. Kreidl. U.S. 2,632,921, Mar. 31. Surface treating polyethylene to improve adhesion of inks.

SURFACING. K. Tanner (to Farberei Schlieren). U. S. 2,633,434, Mar. 31. Producing mat surfaces on thermoplastics.

FILM. P. J. Vaughan (to Wingfoot). U.S. 2,633,456, Mar. 31. Plasticized rubber hydrochloride film.

CEMENT. R. F. Hardwick (to General Electric). U. S. 2,633,457, Mar. 31. Phenol-furfural cement.

RESIN. E. C. Shokal (to Shell). U.S. 2,633,458, Mar. 31. Sulfur-containing polyepoxide resins.

RESIN. J. F. Blais (to American Cyanamid). U.S. 2,633,459, Mar. 31. Melamine resin containing diguanidine carbonate.

POLYMERIZATION. H. T. Neher and L. N. Bauer (to Rohm and Haas). U.S. 2,633,460, Mar. 31. Polymerization of vinyl hydroxyalkyl ethers to polyacetals.

MOLD. H. N. Huse. U.S. 2,633,603, Apr. 7. Mold for plastic materials.

MOLDING. M. Brucker (to Zenith Plastics). U.S. 2,633,605, Apr. 7. Molding resinous products.

WELDING. P. B. Carwile (to Raytheon). U.S. 2,633,894, Apr. 7. Radio-frequency welding of plastic material.

EXPANDED PLASTICS. H. D. Glenn (to U. S. Rubber). U.S. 2,634,243, Apr. 7. Blowing agent for foamed plastics.

EXPANDED PLASTICS. E. Simon and F. W. Thomas (to Lockheed). U.S. 2,634,244, Apr. 7. Foamed alkyl diisocyanate resin.

RESINS. R. P. Arndt (to Pittsburgh Plate Glass). U.S. 2,634,245, Apr. 7. Water-soluble alkyd resins.

RESIN. H. E. Gronich (to Allied Chemical). U.S. 2,634,246-7, Apr. 7. Resin for wet strength paper.

PLASTICIZER. J. Dazzi (to Monsanto). U.S. 2,634,248, Apr. 7. Vinyl chloride resin plasticized with biphenyl dicarboxylic acid esters.

RESIN. K. Vogelsang (to Borden). U.S. 2,634,249, Apr. 7. Ketone-aldehyde-phenol resin.

RESIN. L. Y. Kiley (to U. S. Rubber). U.S. 2,634,250, Apr. 7. Butadiene-vinyl pyridine copolymer-phenolic novolac composition.

RESIN. P. Kass (to Atlas). U.S. 2,634,251, Apr. 7. Linear polyester resins.

POLYMERIZATION. E. L. Warrick (to Dow Corning). U.S. 2,634,252, Apr. 7. Polymerizing organosiloxanes with alkoxides.

RESINS. J. T. Maynard (to Du Pont). U.S. 2,634,253, Apr. 7. Salicylaldehyde polymeric polyprimary polyamine condensates.

POLYMERIZATION. R. D. Lipscomb (to Du Pont). U.S. 2,634,254, Apr. 7. Polymerization of sulfur dioxide with carbon monoxide and monoolefins.

ADHESIVE. D. G. Patterson (to American Cyanamid). U.S. 2,634,255, Apr. 7. Craze-resistant urea adhesive.

RESIN. W. J. Sparks, D. W. Young, and J. D. Garber (to Standard Oil). U.S. 2,634,256, Apr. 7. Olefin-diolefin resin.

RESINS. W. F. Faragher (to Houdry Process). U.S. 2,634,257, Apr. 7. Elastic hydrocarbon polymers.

POLYMERIZATION. W. O. Ney, Jr., W. R. Nummy and C. E. Barnes (to Arnold, Hoffman). U.S. 2,634,259, Apr. 7. Polymerization of N-vinyl pyrrolidine.

POLYMERIZATION. J. E. Carnahan (to Du Pont). U.S. 2,634,260, Apr. 7. Polymerization catalyzed by metal molybdite.

POLYMERIZATION. J. F. Hyde (to Dow Corning). U.S. 2,634,284, Apr. 7. Polymerization of organosiloxanes.

RESIN. D. E. Cordier (to Libbey-Owens-Ford). U.S. 2,635,083, Apr. 14. Formaldehyd -amide resin.

CEMENTS. P. J. Chevalier (to Société des Usines Chimiques Rhone-Poulenc). U.S. 2,635,084, Apr. 14. Siloxane cements.

INSULATION. J. L. Gonnard and J. E. G. Lahousse (to Societé des Usines Chimiques Rhone-Poulenc). U.S. 2,635,085, Apr. 14. Polyvinyl chloride and pitch composition.

POLYMERIZATION. F. H. Norris (to Monsanto). U.S. 2,635,086, Apr. 14. Emulsion polymerization of styrene.

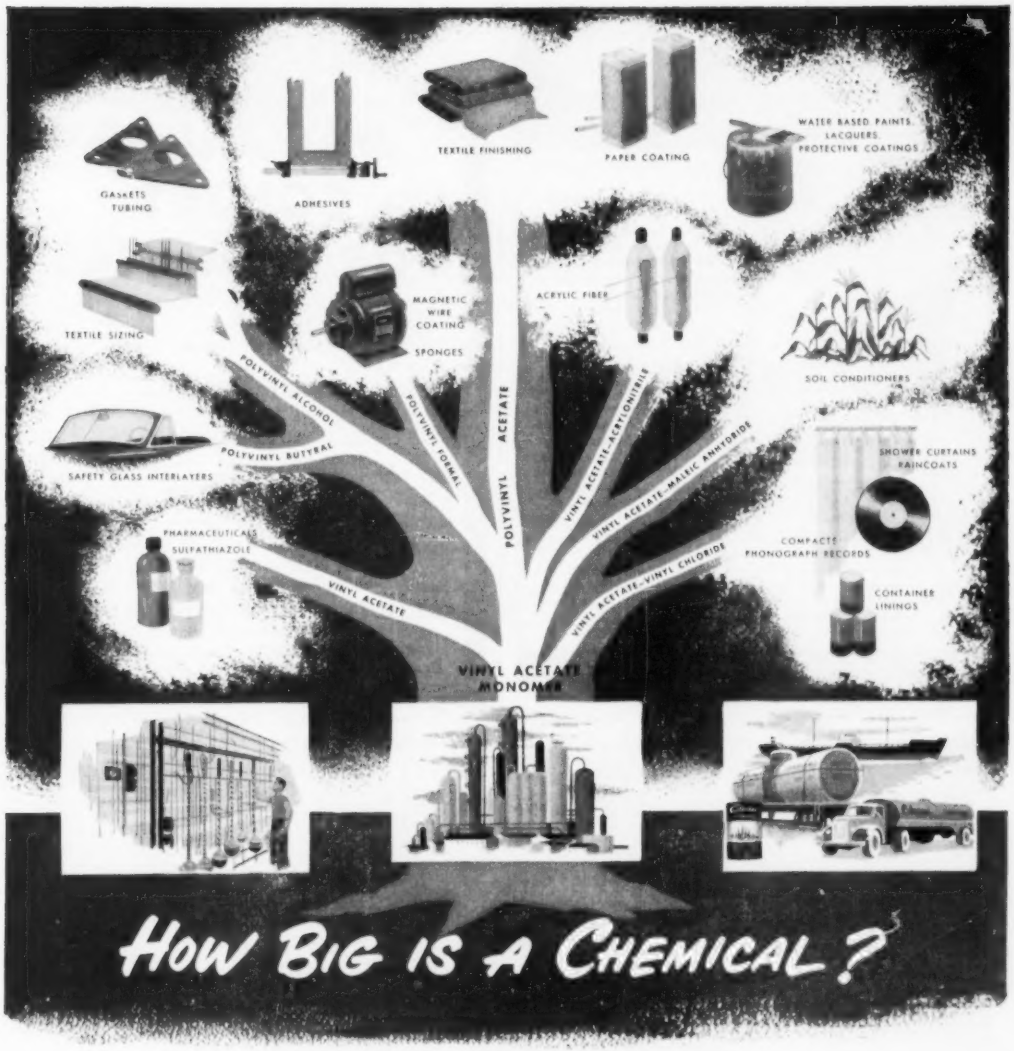
RESIN COMPOSITION. R. L. Holmes (to Raybestos-Manhattan). U.S. 2,-635,088, Apr. 14. Polychloroprene and phenolic resin composition.

POLYESTER. T. F. Anderson (to Libbey-Owens-Ford). U.S. 2,635,089, Apr. 14. Stabilizing polyesters with hydroxybenzoic acid.

ACRYLONITRILE. C. H. Basdekis (to Chemstrand). U.S. 2,635,090-1, Apr. 14. Preparation of acrylonitrile polymers.

COPOLYMERS. G. E. Ham (to Chemstrand). U.S. 2,635,092, Apr. 14. Copolymers of acrylonitrile and an allyl ester of a halogen carboxylic acid.

POLYMERIZATION. C. B. Miller and



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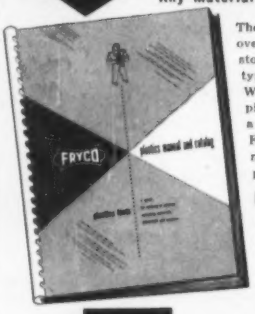

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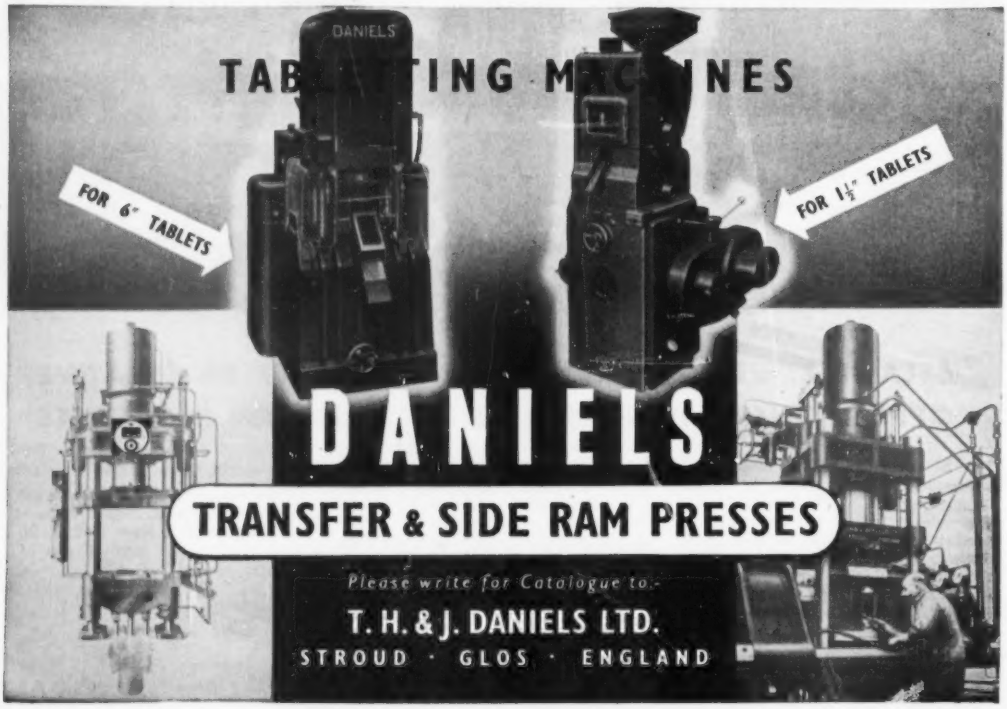

J. D. Calfee (to Allied Chemical and Dye). U.S. 2,635,093, Apr. 14. Polymerization of vinylidene fluoride.

CELLULOSE ESTERS. J. P. Stoneman (to Courtaulds). U.S. 2,635,097-8, Apr. 14. Preparation of cellulose triesters.

SILANES. L. H. Sommer (to Dow Corning). U.S. 2,635,108-9, Apr. 14. Ketosilanes and silalactones.

MOLDING. A. S. Watkins and G. L. Warsack (to Produx). U.S. 2,635,288, Apr. 21. Feeding head for injection molding.

INLAYS. J. J. Larmour (to Plastic Inlays). U.S. 2,635,328, Apr. 21. Plastic inlaid articles.

HEAT SEALING. H. Rumsey, Jr., U.S. 2,635,672, Apr. 21. Apparatus for heat sealing and severing thermoplastics.

SEAMING. R. I. Hakomakix and T. R. James (to General Mills). U.S. 2,635,673, Apr. 21. Seaming apparatus for thermoplastics.

CELLULOSE ESTERS. W. M. Gearhart and R. W. Pugh (to Eastman Kodak). U.S. 2,635,967, Apr. 21. Cellulose esters stabilized with the magnesium disodium salt of ethylene-bis-iminodiacetic acid.

CONSTRUCTION BOARD. J. G. Meiler, E. G. Hallonquist, and A. H. Rauch (to Plywood Research). U.S. 2,635,-976, Apr. 21. Construction board of phenolic resin, an elastomer, and lignocellulose.

SPONGE. C. L. Wilson and G. H. Schilling. U.S. 2,636,013, Apr. 21. Frothed polyvinyl formal sponge containing solid particles.

FILM. O. M. Arnold. U.S. 2,636,014, Apr. 21. Polycarbonamide plastic.

RESINS. C. F. Van Gilder (to Standard Oil). U.S. 2,636,016, Apr. 21. Butadiene-diisobutylene copolymers.

CASTING RESIN. L. C. Rubens and R. F. Boyer (to Dow). U.S. 2,636,018, Apr. 21. Styrene-unsaturated alkyd resin casting compositions.

ION EXCHANGE. G. B. Butler and B. M. Benjamin (to Research Corp.). U. S. 2,636,019, Apr. 21. Resins from phenol, formaldehyde, and a Mannich base.

RESIN. H. Zenftman and R. McGillivray (to Imperial Chemical Ind.). U.S. 2,636,020, Apr. 21. Reaction product of a phosphonic acid dichloride, a dihydroxy compound, and a resin.

RESIN. R. B. Thompson (to Universal Oil Products). U.S. 2,636,021, Apr. 21. Condensate of dibenzalacetone and hydrogen sulfide.

COPOLYMERS. P. J. Culhane and G. M. Rothrock (to Du Pont). U.S. 2,-636,023, Apr. 21. Copolymers of vinyl chloride, acrylonitrile, and a vinyl pyridine.

INTERPOLYMERS. R. J. Wolf (to B. F. Goodrich). U.S. 2,636,024, Apr. 21. Interpolymer of vinyl chloride, vinyl acetate, and 2-ethylhexyl acrylate.

POLYMERIZATION. R. F. Howe and F. A. L. Holoway (to Standard Oil). U.S. 2,535,025, Apr. 21. Polymerization of isoolefins.

POLYMERIZATION. J. F. Nelson (to Standard Oil). U.S. 2,636,026, Apr. 21. Polymerization of olefins.

POLYMERS. H. W. Coover and J. B. Dickey (to Eastman Kodak). U.S. 2,636,027, Apr. 21. Polymers of alkyl esters of allyl phosphonic acids.

RESINS. H. J. Sommer, T. B. Albin, and P. H. Williams (to Shell). U.S. 2,636,028, Apr. 21. Organic acid-polyamine adducts.

EXTRUSION. C. D. Orsini (to Nixon Nitration). U. S. 2,636,218, Apr. 28. Extrusion die.

FIBERS. E. T. Cline and H. B. Stevenson (to Du Pont). U.S. 2,636,-803-4, Apr. 28. Polyvinyl alcohol fibers.

RESIN. F. W. Banes, D. W. Young, and A. J. Hund (to Standard Oil). U.S. 2,636,866, Apr. 28. Polyvinyl chloride plasticized with isobutylene-diolefin-acrylonitrile copolymer.

RECORD. G. P. Humfeld (to Radio Corp. of America). U.S. 2,636,867, Apr. 28. Plastic sound record.

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VACUUM COATER—Engineered for pilot plant or other limited production operations, Model 3111 vacuum coater, offered by National Research Corp., 70 Memorial Dr., Cambridge, Mass., is intended to bridge the gap now existing between laboratory and full-production vacuum metallizing equipment.

The unit is provided with the company's rotary gas ballast pump, which is said to be capable of pumping water vapor without loss of pumping speed or capacity, and without contamination of oil. All necessary instrumentation, including a Model 511 Alphatron vacuum gage, is an integral part of the coater. The vertical coating chamber is 24 in. in diameter and 30 in. high.

The coater can be easily operated by one man.

HOT STAMPING PRESS—Plastics articles up to 24 in. high can be marked by the hot leaf process with Kensol #100, engineered by Olsenmark Corp., 124 White St., New York 13, N.Y.

The press is air operated and has an adjustable electric dwell timer. It is thus possible to compensate for variations in thicknesses in plastics items which would otherwise prove troublesome in a run.

The stroke of the head is 3 in., allowing pieces to be fed and removed speedily, and assuring even roll leaf pull of the 4- by 8-in. roll leaf attachment.

MARKING MACHINE—Essentially automatic marking on plastics and metal is made possible by a new air-operated assembly developed by The Acromark Co., 310 Morrell St., Elizabeth, N.J., and incorporated in its Series 9AA marking machines. Operated from standard air lines, the unit requires a pressure of only 75 p.s.i.

For marking bottle caps, tool handles, molded plastics jars, and other tubular or round objects, the parts roll down an incline and are fed under the marking die by air pressure, marked, and then ejected. The valve controlling the feed is actuated by each stroke of the marking machine; at the completion of each stroke, another valve provides air pressure for the ejection of the marked part.

For plastics parts, the marking die is electrically heated to a thermostatically controlled temperature. Metal marking is accomplished without the use of the heating element.

Dimensions of the Series 9AA machine are 30 in. long, 21 in. high, and 14 in. deep.

BEADING UNITS — Single edge beading of sheet plastic in thicknesses from 0.005 to 0.020 in. is accomplished by Model 144 Thermobeader, produced by Taber Instrument Corp., 111 Goundry St., N. Tonawanda, N.Y.

Features of the unit include interchangeability of dies for producing nine different standard-size beads on sheet stock, roll material, die-cut blanks, and strips; an automatic temperature control which maintains dies at their most efficient operating temperatures; a preheating die located in the same tilting holder as the beading die for maximum accessibility; and a large blower for faster chilling of freshly formed beads.

Taber Instrument's Model 144 Thermobeader produces 9 different standard-size beads with interchangeable dies

TANK-MOUNTED VACUUM PUMP—Designed for vacuum drawing of plastics, package evacuation, and similar functions, a tank-mounted vacuum pump unit has been produced by Squire-Cogswell Co., 4140 N. Kedzie Ave., Chicago 18, Ill.

One of the features of the pump is that instant surges of vacuum are repeatedly available because of the large reserve capacity of the vacuum tank. The pump is of the rotary oil-sealed type and is designed to run continuously; however, it may be provided with an automatic control switch, if specified.

FLAME SPRAYING EQUIPMENT—Coatings from thermoplastic materials which do not readily dissolve in common solvents at normal operating temperatures, such as polyethylene, can be produced with the new model Flame Spray Gun and Material Hopper developed by American Agile Corp., P. O. Box 168, Bedford, Ohio.

The equipment is designed with a jet-tube feeding arrangement which, the manufacturer claims, assures uniform powder supply into the spray gun and an even deposit of the flame-sprayed coating. The jet-type feeder tube eliminates the necessity of an air-operated vibrator.

Polyethylene flame-sprayed coatings can be obtained in thicknesses from $\frac{1}{32}$ to $\frac{1}{4}$ inch.

The capacity of the unit for polyethylene is about 20 lb. per hour.

ELECTRONIC HEATER—Crystal controlled for frequency stability, the Erdco r-f generator, produced by Engineering Research & Development Co., Addison, Ill., operates on 27.12 mc. and complies with FCC regulations without the need for shielding. Its circuit is designed to eliminate spurious and harmonic radiations.

Occupying a floor space of 23 by 24 in., the heater has single-knob power control, adjustable from zero to maximum. Sealing time varies

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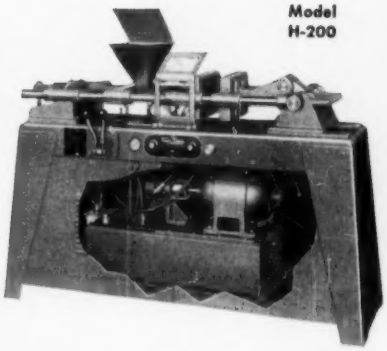

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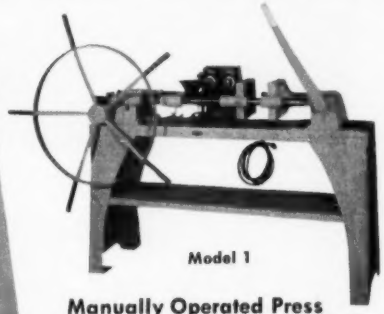

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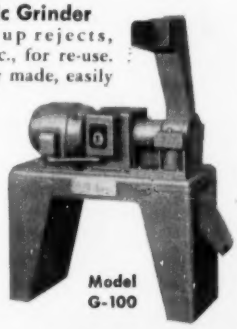
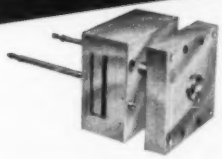


Model G-100



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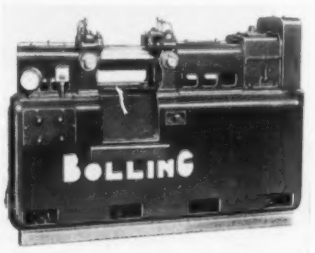
LABORATORY MILL—Laboratory 2-roll mill for plastics or rubber, introduced by Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland 27, Ohio, has 6-in. diameter by 13-in. face chrome-plated rolls driven by universal joints which permit wide roll opening without the use of ex-



Bolling's laboratory 2-roll mill is fully enclosed, except for working faces of 6-in. diameter chrome plated rolls

ternal connecting gears. The roll bearings are Timken anti-friction with a full flood lubricating system.

Helical gears in the drive stand serve to reduce noise and vibration to a minimum. Piping for steam or water is built in. All parts, other than the working faces of the rolls, are fully enclosed.

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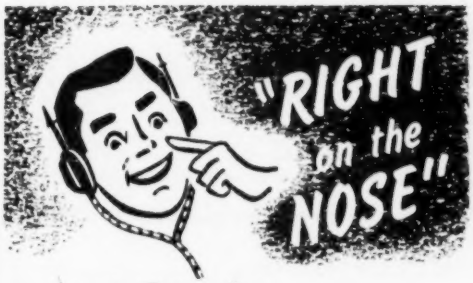

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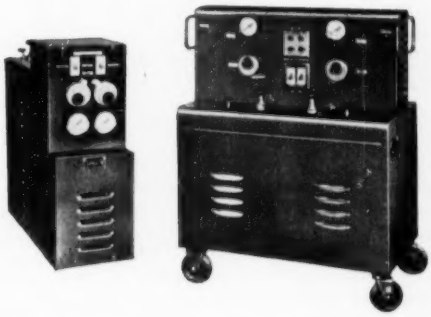

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A compact unit designed for permanent installations. (Can be equipped with casters). Requires approximately 50% less floor space than Model 6002 with same capacities.

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The mobile temperature control unit functioning in leading plastics plants from coast to coast. Ready to operate when connected to electricity, water and drain.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"ASTM Standards on Plastics"

Published in 1953 by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 705 pages. Single copy price $5.25.

Standards, specifications, definitions, and tests for a wide range of plastics are covered in this publication. Included are sections on phenolic, styrene, melamine, urea, cellulose, acetate, vinyl chloride, and methacrylate molding compounds, as well as sheets, rods, tubes, and other shapes made from them. Test methods are described for strength, hardness, thermal, optical, electrical, and permanence properties. Also detailed are analytical methods; molds and molding processes; and conditioning of plastics. A section of definitions and nomenclature is included.

"Sears, Roebuck de Mexico, S.A." by Richardson Wood and Virginia Keyser.

Published in 1953 by National Planning Association, 1606 New Hampshire Ave., N. W., Washington 9, D. C. 68 Pages. Price $1.00 (75¢ to N. P. A. members).

The first N.P.A. case study of U.S. business performance abroad covers the development of Sears, Roebuck in Mexico and the impact it has had on the economic, social, and cultural life of the country. The company's history in Mexico since its start in 1947 is analyzed in terms of contributions to the basic economy and living standards, institutional and cultural effects, relations with native suppliers, competitors, and customers, and managerial practices.

"Report of the Thirty-Seventh National Conference on Weights and Measures, 1952" (National Bureau of Standards Miscellaneous Publication 206).

Published in 1953 by Government Printing Office, Washington 25, D. C. 105 pages. Price 40¢.

Addresses and reports on weights and measures given by representatives who attended the conference sponsored by the National Bureau of Standards are presented in this publication. The topics include standardization of food packages, measurement of petroleum, belt conveyor scales, and many others. The report also includes actions of the conference with regard to specifications and tolerances for commercial weighing and measuring devices—specifically prepackaged ice cream measure containers, cordage measuring devices; liquified petroleum gas measuring equipment, small-capacity scales, and liquid measuring devices.

"Deutches Jahrbuch fuer die Industrie der plastischen Massen 1951/1952," edited by Dr. -Ing. Karl Fabel.

Published in 1953 by Wilhelm Pansegrau Verlag, Berlin-Wilsmersdorf, Uhlandstr. 102, Germany. 646 pages. Price 50 DM (ca. $11.50). In German.

The second post-war plastics annual published in Germany covers worldwide developments in plastics from 1950 to the beginning of 1952. The first half of the volume deals with materials, their chemical and physical properties, and their uses. Applications for each compound are given in great detail. Most of the second part is devoted to fabrication and machinery. Both topics are covered simultaneously by discussing each fabricating method in reference to the specific equipment used for it. Coverage, again, is world wide. A list of material trade names (giving chemical composition and country where held), and a list of German firms supplying the plastics trade, round out the yearbook.

"Synthetic Organic Chemistry," by Romeo B. Wagner and Harry D. Zook.

Published in 1953 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 887 pages. Price $11.50.

Designed to summarize in a single volume the methods of organic reactions most frequently used in the preparation of mono- and di-functional compounds, this volume contains a list of the best reactions used during the past 30 years. Each chapter is devoted to the formation of compounds containing a specific functional group or related groups; the discussion of each reaction, in turn, includes modifications and improvements of former procedures, catalyst studies, and notes on the generality and scope of the reaction. Over 500 summaries of methods are covered, and reference to chemical literature is profuse. The authors also list over 6000 compounds in tabular form with references to their preparation, yields, and physical constants.

Monomer-polymer price list—Prices for research quantities (100, 500, and 1000 g.) of over 300 monomers and polymers available from the company are listed in catalog A-5. The main alphabetical listing is supplemented by an application section where materials are grouped in terms of uses. *Monomer-Polymer Inc., Leominster, Mass.*

Behavior of plastics—Progress report on a basic research project to define the behavior of plastics is contained in the booklet "Research in Plastics." The research is being conducted at the Massachusetts Institute of Technology under the sponsorship of 18 major chemicals and plastics firms. The booklet contains reports on new testing equipment and the development of empirical equations to express the generalized behavior of plastics materials under various conditions. *Manufacturing Chemists' Association, Inc., 350 Fifth Ave., New York 1, N. Y.*

Hose, belts, tapes—In "Sunday Supplement" style, an 8-page rotogravure brochure lists the company's line of products for the mining and allied industries. Each product is related to a case history. "Products for the Mining Industry" covers hose, conveyor belts, V-belts, and plastic tape, and stresses applications and installations. *Boston Woven Hose & Rubber Co., Cambridge, Mass.*

Chemical resistance chart—The chemical resistance of Buna N, Buna S, natural, neoprene, and butyl rubber to a variety of chemical compounds is presented in convenient chart form. The chemicals covered include commercial organic chemicals (gasoline, toluene, etc.), organic chemicals (acetone, carbon tetra-

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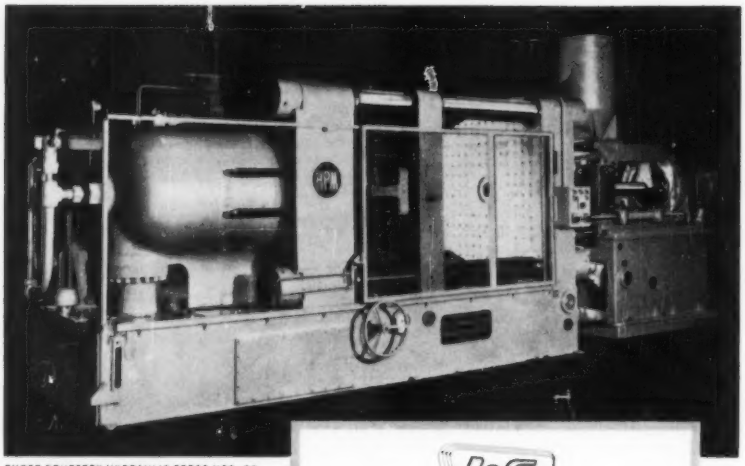

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chloride, etc.), acids, salts, and some gases. *Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown 1, Ohio.*

Color in plastics—The art and science of matching color in polystyrene at the company's color laboratories is outlined in the 24-page booklet "Color in Plastics." Illustrated in full color, it takes the reader, step-by-step, through the various processes which are necessary to arrive at a truly matched color. Also presented are the basic fundamentals of color and some of the terminology used in its study. A bibliography of color literature is provided. *Chemical Div., Koppers Co., Inc., Pittsburgh 19, Pa.*

Plastisols—A group of plastisols for use in corrosion protection, abrasion resistance, and electrical insulation is described in this 4-page bulletin. The plastisols are dispersions of high molecular weight polyvinyl chloride resins in selected liquid plasticizers. The bulletin contains illustrations of various applications and presents specifications, formulation procedures, and application techniques. Included in the latter are dipping, spreading, and casting methods. *Houghton Laboratories, Inc., Olean, N. Y.*

Materials handling—A line of materials handling equipment is presented in a reference chart arranged in such a way as to list various materials handling methods and equipments under major categories. Under "Bulk Handling," for instance, the chart shows pneumatic equipment, car unloader, bucket elevator, and troughed belt, among others. Equipment listed also includes chain and cable conveyors, cranes and hoists, power and hand trucks, truck accessories, storage equipment, monorail and accessories, and package handling tools. *Kornylak Engineering Corp., 513 Communipaw Ave., Jersey City 4, N. J.*

Bureau of Standards—Summarizing scientific and engineering investigations conducted by the National Bureau of Standards, The Annual Report 1952 (NBS Miscellaneous Publication 207) contains accounts of current activities and detailed descriptions of representative projects. Major fields of activity include electricity, optics, metrology, heat and power, physics, chemistry, organic and fibrous materials, basic instrumentation, and others. Price 30¢. *Government Printing Office, Washington 25, D. C.*

Pneumatic conveyor—Pneumatic conveying systems and transfer trucks, described and illustrated in this 8-page bulletin, are designed for use in the bulk handling and transportation of pulverized, granular, or small broken materials such as dry chemicals, grain, clay, fertilizers, sand, and the like. The conveying equipment consists of a suction nozzle or feeder, a flexible conveying pipe and air line, a discharge device, an air pump, and a filter to clear the air stream. The transfer trucks incorporate similar equipment. The bulletin contains engineering drawings as well as installation notes. *Holly Pneumatic Systems, Inc., 15 E. 40th St., New York 16, N. Y.*

Chemicals catalog—Detergents, wetting agents, emulsifiers, brighteners, sequestrants, and dyeing assistants are the product groups covered in a new catalog. It also contains application suggestions for agricultural, cosmetic, latex, leather, metal, paint, paper, rubber, textile, synthetic fiber, and various other specialty fields. *Antara Chemicals, Div. of General Dyestuff Corp., 435 Hudson St., New York 14, N. Y.*

Hydraulic pumps and motors—An engineering data book gives technical information, performance data, and drawings on a line of heavy duty hydraulic pumps and motors. These pumps and motors are suitable for either open or closed hydraulic circuits and are particularly adapted to heavy machinery drives requiring precise control of torque, acceleration and deceleration, speed, or reversal. Applications include large presses, rotary machine drives, testing equipment, etc. Units are available in ten sizes with capacities of 28 to 2300 gal./min. at rated speeds, and 50 to 4000 hp. in the range of 2000 to 3000 p.s.i. *Vickers, Inc., Waterbury Tool Div., Commercial Hydraulic Dept., Waterbury, Conn.*

Packaging tape—Techniques for packaging with high tensile tape are described in this folder. Dimensional diagrams show how to tape packages

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Compressed air—Model B-30-D Condensifilter, designed to produce instrument-quality air for all compressed-air applications from ordinary plant air, is described in this bulletin. Construction information, technical data, and recommended applications are included. *Hankison Corp., 231 Biltmore Bldg., 951 Banksville Rd., Pittsburgh 16, Pa.*

Mechanical engraving accessories—Bulletin 32T describes 15 styles of letters and numerals in master type sets for use in mechanical engraving. It also lists master sets for technical symbols, Greek upper and lower case alphabets, and describes special templets. *Green Instrument Co. Inc., 385 Putnam Ave., Cambridge 39, Mass.*

Acrylic signs—How architects can utilize Plexiglas to harmonize signs with architectural design is the subject of a booklet titled "Plexiglas—The Outdoor Plastic—for Signs." *Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.*

Chemical properties charts—The Deutsche Gesellschaft für chemisches Apparatewesen (DECHEMA) has started work on the 3rd edition of its Werkstoff-Tabelle, expected to cover the behavior of about 100 construction materials in the presence of 850 different chemical agents. An individual sheet will be devoted to each of these materials; the first is now available. The entire work is expected to be completed in about two years. A 16-page prospectus, presenting a fairly comprehensive survey of the work, and including price information, may be had from: *DECHEMA, Frankfurt/Main 13, Germany.*

Machinery—Catalog 515 describes and gives specifications for compression molding presses, extruders, and preform presses; 21 models are covered. The molding presses are of the fully automatic as well as the semi-automatic type, and range in capacities from 15 to 300 tons. The extruders range from 65 to 200 lb. per hour. The preform presses come in single-punch, rotary, and hydraulic models, with the latter making preforms up to 10 pounds. Also available are Bulletin 507—which lists specifications and operating details for the Model 235-A automatic molding press, with a capacity of 50 tons—and Bulletin 506, giving technical details on the Model 741 fully automatic plastics compression molding press. *F. J. Stokes Machine Co., Philadelphia 20, Pa.*

Tetrafluoroethylene resin—Technical data on the properties of Teflon are presented in this 8-page catalog. Also included are application notes, a section on design considerations, and a listing of the company's line of Teflon rods, tubing, slabs, and tape—with specifications on size, shape, and tolerance. *The Polymer Corp. of Pa., Reading, Pa.*

Teflon rings—Dimensional specifications and range of available sizes for spiral back-up rings made of Teflon are presented in this four-page folder. The rings are designed for use in conjunction with "O" ring seals—or as piston rings—in hydraulic or

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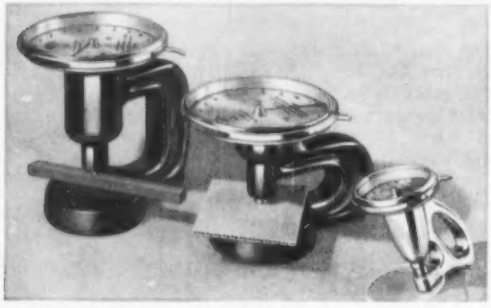

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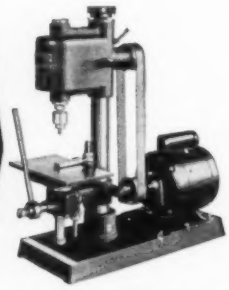

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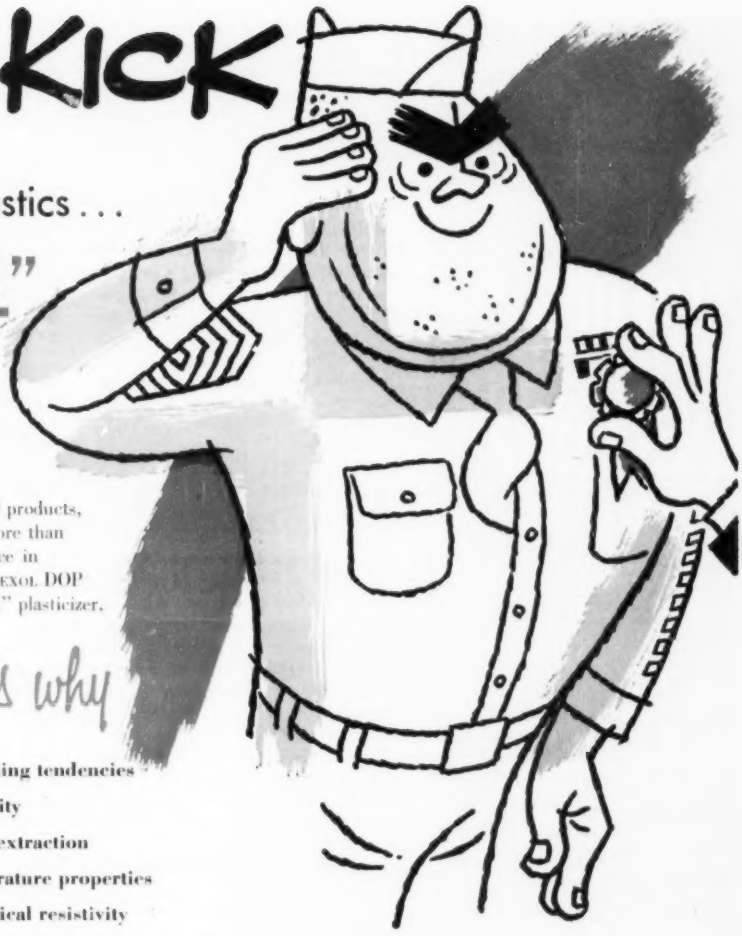

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pneumatic applications, particularly in systems operating above 1500 p.s.i. and 250° F. The folder also contains information on the company's line of Fluoroflex-T rod, sheet, and tube stock. *Resistoflex Corp., Belleville 9, N. J.*

Idea development—This 12-page booklet entitled "Ideas into Dollars," outlines the work performed by the organization in developing a product idea into full-scale commercial production, the client for whom the work is performed being charged on a budget and time basis. *The Commonwealth Engineering Co. of Ohio, 1771 Springfield St., Dayton 3, Ohio.*

Vacuum metallurgy—Technical data sheets describe Cuprovac-E, gas-free high-purity copper with properties suited for vacuum tube manufacture and Ferrovac-52100, a gas-free alloy bearing steel with improved fatigue properties. Also offered by the company are two reprints: "Economical Finishing with Vacuum Metallurgy" describes the use of vacuum metallizing in the manufacture of both plastics and metal parts. "High Vacuum Vapor Pumps" discusses the important characteristics of these units and presents a means of correlating these factors for industrial applications. *National Research Corp., 70 Memorial Dr., Cambridge, Mass.*

Temperature control—Model 200 Series Capacitrols—for indicating on-off, proportioning, and anticipating temperature control—are described in Bulletin F-5783. The bulletin contains specifications and operating diagrams for the various models in the series, as well as outlines of the principles on which they operate. *Wheelco Instrument Div., Barber-Colman Co., Rockford, Ill.*

Industrial controls—Catalog 8305 lists the company's non-indicating, non-recording controllers designed to regulate process variables. These controls are applicable to simple processes which do not warrant the use of more complex indicating and recording instruments. The controls covered by the catalog include electric, electronic, and pneumatic units. Five pages of general application notes and installation diagrams precede the general listing of instruments. Specifications and ranges are given for each control. *Minneapolis-Honeywell Regulator Co., Station 64, Wayne & Windrim Aves., Philadelphia 44, Pa.*

Hydraulic presses—Bulletin describes new line of hydraulic presses with a range of 20 to 400 tons, for use in plastics and rubber molding, laminating, straightening, pressing, forming, staking, and broaching. *Hydraulic Div., Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill.*

Mold temperature control—Technical Bulletin No. 7 presents a symposium on the importance of injection mold temperature control and a chart-form summary of what happens if mold temperature is too high or too low. The bulletin also contains information on the company's mold heating and cooling unit, Model JS-1. *Sarco Co., Inc., 350 Fifth Ave., New York 1, N. Y.*

Plant construction—"The Story of the Builders" is the company's 32-page tribute to its Engineering Dept. on the occasion of the department's 50th anniversary. The booklet, lavishly illustrated, shows the complicated nature of present-day plant construction, compares today's industrial output with that of the not-too-distant past, and traces the parallel development of an expanding technology and the rising American standard of living. *E. I. du Pont de Nemours & Co., (Inc.), Public Relations Dept., Wilmington 98, Del.*

Engineering—The five fields of engineering—civil, mining and metallurgical, mechanical, electrical, and chemical—are described in "Engineering—A Creative Profession." Educational requirements and vocational prospects are also covered. 25¢ per single copy, 20¢ per copy in quantities of 50 or more. *Engineers' Council for Professional Development, 29 W. 39th St., New York 18, N. Y.*

Testing—Accelerated weather testing of paints, plastics, color, fabrics, films, etc., in Phoenix, Ariz., is discussed in this folder, which points out that Arizona has the most sunshine, the most solar radiation, the most ultra-violet light, the most heat, the greatest thermal shock, and

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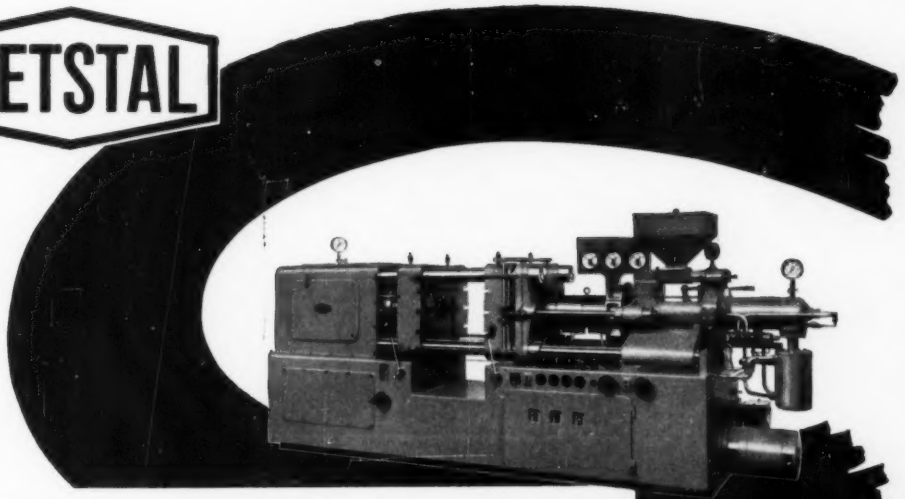

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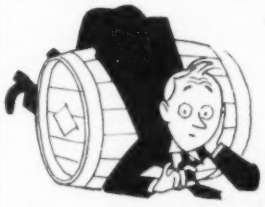

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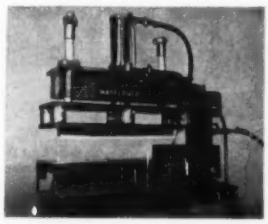

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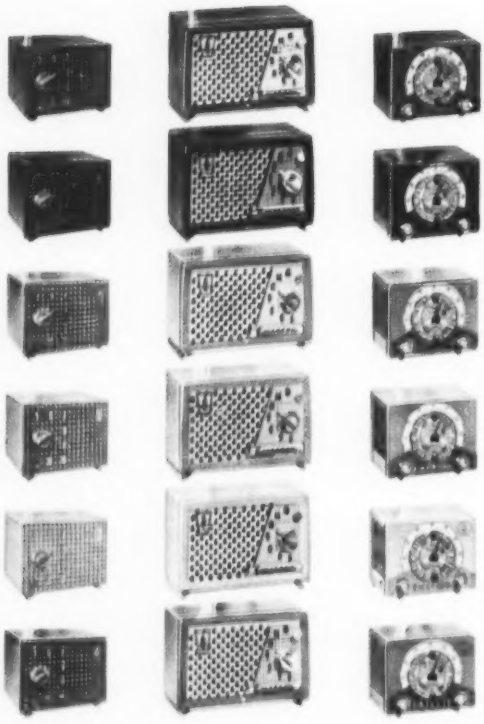

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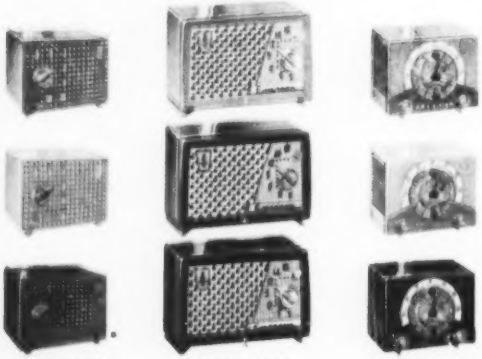

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New Emerson Decorator Colors are House & Garden's cherry red, hot chocolate, forest green, cloud grey, cerulean blue, sand, willow green; and ivory, ebony, walnut and pink.

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PLASKON

UREA

FOR QUALITY AND COLOR IN PLASTICS

LOF GLASS PLASKON FIBER GLASS

PLASKON DIVISION

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Toledo 3, Ohio

District Offices: Boston • Charlotte, N.C. Chicago • Cincinnati • Cleveland Detroit • Los Angeles • New York Philadelphia • Washington, D.C.

Manufacturers of Molding Compounds, Resin Glues, Coating Resins

In Canada: Canadian Industries, Ltd. Montreal, P.Q.

and the molder says:

WE MOLDED THE SALES APPEAL OF COLOR INTO EMERSON RADIOS

"The colorful housings that have contributed so vitally to Emerson sales increases, were molded here at Plastimold from Plaskon housing-type urea.

"We found that the new material flowed freely, yet retained the rapid-curing characteristics of Plaskon's standard urea. While housing-type urea possesses the fine properties of regular urea compounds, we found that it remains in the plastic state longer and passes mold obstructions easily; thus readily forming the dense, homogeneous masses required by the cabinet designs."

—*John Stenberg, President of Plastimold, Inc., Attleboro, Massachusetts*

The competent know-how that characterizes today's fine custom molder—exemplified here by Mr. Stenberg's organization—can smoothly turn the designer's idea into commercial reality. Plaskon's new urea, developed specifically for the molding of colorful large housings, can be the common substance that brings profitable results to the whole team—to the designer, molder, manufacturer, and the retailer.

the greatest aridity of all 48 states, and is therefore ideally suited for exposure testing of all kinds. *Desert Sunshine Exposure Tests, 7740 Ramona Rd., Phoenix, Ariz.*

Electric heating—Running 24 min., "This Amazing Heat" is a 16-mm. sound-and-color film showing resistance-type electric heating units at work in a wide range of industrial processes. A number of case histories point out the benefits of using the basic strip, tubular, radiant, and cartridge units, individually or in packaged combinations. Scheduling and other information available from *Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.*

Flotation agents—The 1953 edition of "Flotation" describes briefly the process in which air bubbles are used to float one kind of particle from a mixture of two or more kinds of finely divided materials suspended in water. The functions of flotation agents are discussed and information is given on the use of Rada (rosin amine D acetate) as a collector for silica and silicate minerals. A table gives shipping data on all of the company's products for flotation, and an appendix presents mathematical formulas used in the operation and control of modern ore dressing mills *Hercules Powder Co., Wilmington 99, Del.*

Experimental chemical—Physical and chemical properties of N-phenylmaleamic acid, an experimental chemical said to have many interesting potentials for chemical synthesis, are described in New Product Bulletin 30. Laboratory experiments with the compound have resulted in copolymerization with acrylonitrile, ethyl acrylate, vinyl acetate, and other monomers. *New Product Development Dept., American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Research—The firm's newly opened research laboratories are described in this illustrated 24-page brochure. The new facilities are geared to perform research in compounding, physical testing, pigment application, ceramics, organic compounds, analytical chemistry, electron microscopy, and pilot plant production problems. *Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass.*

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job-designed to meet your formulation needs

Witco manufactures a line of plasticizers to meet your individual requirements. The services of Witco's Technical Service Department are available to processors with specific problems involving the use of these plasticizers.

WITCO Butyl Stearate . . . as a plasticizer—solvent in coating compositions.

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WITCO Dibutyl Phthalate...high efficiency and compatibility for nitrocellulose lacquers.

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WITCO Dioctyl Adipate . . . outstanding primary plasticizer for vinyls.

WITCO Dioctyl Phthalate . . . low volatility, lack of odor, excellent light and heat stability.

WITCO Methylcyclohexyl Stearate . . . secondary plasticizer in PVC.

Write for Technical Service Reports on these products.

Above products manufactured by WITCO in its Chicago plant.

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Announcing A New

AUTOMATIC SPRAY-DECORATING MACHINE

which is electrically dial-controlled for loading or dwell time, and gun-spraying time, all within 1/10 of a second.

This machine can paint from zero to a 24-inch stroke. The air hold-down pistons are fully adjustable and automatically coordinated with the painting cycle. In stationary position, the machine will cycle up to 3,600 times per hour—probably faster than any operator could handle the parts.

The machine shown is now painting 600 refrigerator door shelves per hour with masking over an area 24 inches long.

Cut Spray-Decorating Costs

by rapidly wet-painting three dimensional parts, one color after another, through the use of

ELECTRO-FORMED METAL SPRAY PAINTING MASKS

(Made by patented process)

automatic spray decorating machines, and foot-treadle, air-operated clamps, fixtures and tools which position and hold the piece snugly in the mask and permit the operator to use both hands.

Plug-type masks keep depressed areas clear, while spraying background; lip-type masks protect background while painting depressed areas; and block-cutout, plane-surface-type masks.

Clean, sharply defined letters and decorative effects are obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas with no fogged edges. After-wiping or buffing-off of overspray is unnecessary. The "loose" inside of letters and numerals, such as "O" and "6," is held in position by arched bridging to eliminate objectionable "ties."

We also build mask-washing equipment.

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Please send, without obligation, details on ( ) Automatic spray decorating machines; ( ) Automatic rotary indexing painting machines; ( ) Automatic, single-spindle painting machines; ( ) Hand masks; ( ) Mechanical masking fixtures; ( ) Air-operated masking fixtures; ( ) Stationary, automatic, spray-painting, masking machines; ( ) Rotary-table, automatic, spray-painting, masking machines; ( ) Mask-washing equipment; ( ) Quotation on masks for parts (or prints) which I am forwarding.

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No limit on smallness. Intricacy and precision—our unique features.

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Automatic insert feed permits wide variety of product possibilities.

CONTINUOUS INSERTS
Small members accurately spaced on tape, cord, wire chain, etc.

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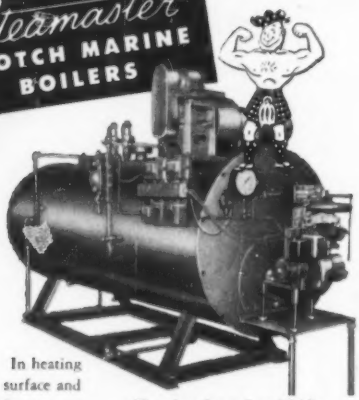

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BRADFORD NOVELTY COMPANY
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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTIC AND SYNTHETIC RESIN PRODUCTION IN
From Statistics Compiled

Materials	*Total p'd'n first 3 mos. 1953*	*Total sales first 3 mos. 1953*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	3,845,059	3,910,165
0.003 gage and over	3,009,950	2,983,725
All other sheets, rods and tubes	1,427,406	1,292,257
Molding, extrusion materials	19,300,612	19,109,436
Nitrocellulose:		
Sheets	1,774,810	1,549,259
Rods and tubes	133,959	200,004
Other cellulose plastics[b]	1,766,105	1,742,242
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	20,365,096	13,794,030
Adhesive	13,159,114	12,164,190
Molding and casting materials[a]	54,314,714	57,239,076
Protective coatings (modified and unmodified except by rosin)	8,099,221	7,213,233
Miscellaneous uses	21,284,427	19,150,978
UREA and MELAMINE RESINS:		
Adhesives	18,395,864	17,714,374
Textile-treating resins	8,873,343	9,248,666
Paper-treating resins	6,103,452	5,560,515
Protective coatings, modified and unmodified	7,349,983	5,331,666
Miscellaneous uses, including laminating and molding[c]	17,789,419	20,316,445
STYRENE RESINS:		
Molding materials[a]	84,905,709	78,961,510
Protective coatings, modified and unmodified	20,747,916	21,415,967
Miscellaneous uses	22,410,388	19,653,454
VINYL RESINS:[d] Total	132,255,012	129,311,072
Sheeting and film (resin content)[e]		34,972,346
Adhesives (resin content)		5,795,562
Textile and paper-treating resins (resin content)[f]		13,379,623
Molding and extrusion materials (resin content)		44,246,066
Protective coatings (resin content)		7,473,783
Miscellaneous uses (resin content)		9,678,176
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	45,659,196	44,861,693
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a,g]	33,546,223	31,719,674
Protective coatings[h]	1,990,528	1,282,135
All other uses[i]	32,491,206	32,941,289

[a] Dry basis is designated unless otherwise specified. [b] Includes fillers, plasticizers, and extenders. [c] Includes sheets, rods, and tubes, and molding and extrusion materials. [d] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [e] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total produc-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

POUNDS[a] FOR FEBRUARY AND MARCH 1953 by U. S. Tariff Commission

February 1953		*March 1953*	
Production	*Sales*	*Production*	*Sales*
1,267,015	1,192,692	1,556,112	1,500,992
940,218	955,159	1,244,241	1,246,703
367,450	403,178	547,422	528,999
6,207,035	5,910,498	7,101,619	6,976,129
547,117	468,428	674,383	573,490
46,131	55,041	31,584	68,570
520,661	537,323	712,983	586,213
6,217,404	4,193,004	7,040,352	4,785,494
4,134,606	3,950,724	4,947,345	4,479,453
16,033,653	16,940,740	21,169,632	21,033,348
2,471,827	2,405,019	3,072,617	2,634,127
6,588,937	5,998,053	7,686,148	6,489,858
5,791,555	6,120,279	7,199,229	6,866,251
3,162,212	3,244,782	2,739,809	2,795,891
2,054,333	1,958,995	1,955,369	1,628,319
2,721,868	2,027,043	2,094,052	1,384,819
5,188,389	6,887,552	7,401,131	7,426,548
27,269,409	26,522,055	31,793,740	27,994,037
6,324,203	6,591,139	7,480,985	7,821,658
7,104,195	6,009,847	8,211,036	7,234,217
41,027,688	41,808,347	46,721,431	45,511,946
	16,338,758		17,574,822
	1,890,737		1,918,053
	4,145,430		4,950,341
	13,909,818		14,906,442
	2,604,175		2,479,647
	2,919,429		3,682,641
14,925,061	14,295,838	16,356,035	15,872,094
10,781,404	9,664,894	12,035,602	12,406,160
620,859	465,713	690,127	425,853
10,522,152	10,558,010	10,910,579	11,149,363

tion are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [f] Includes data for spreader and calendering-type resins. [g] Includes data for acrylic, polyethylene, nylon, and others. [h] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [i] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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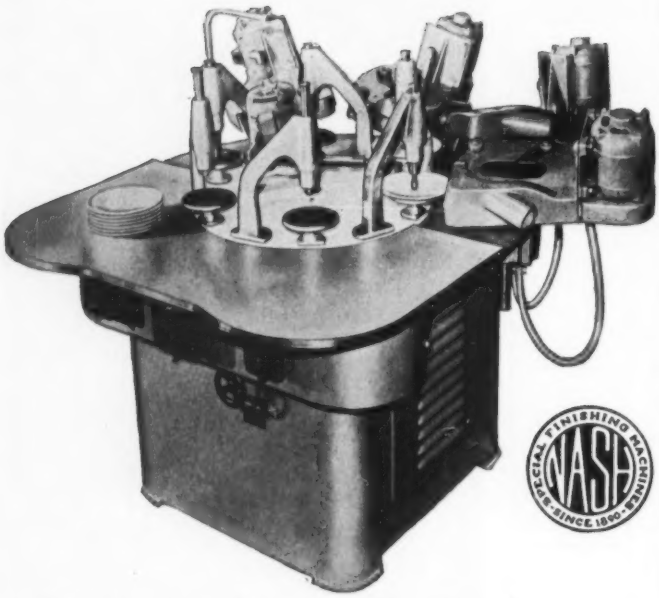

Better Work . . . Faster Production

On Plastic Dinnerware and Circular Mouldings

with the

NASH 116 ROTARY EDGER

It's the modern way to remove flash from plastic dinnerware and circular moulded pieces. Gives you a perfect finish at the rate of 8 to 24 pieces per minute . . . on mouldings from 3″ to 11″ in diameter.

The proper combination of spindle speed and turntable speed (both easily adjustable) is determined by the amount of flash removal desired. Accurate control of the finished diameter is governed by the position at which you set the universally mounted abrasive belts.

Rapid — Automatic — Accurate

Four high-speed abrasive belt units, universal in adjustment, do the work. They are mounted around the turntable which carries six spindles. Mouldings placed on the spindles then rotate, and as the turntable slowly revolves, are brought into contact with each abrasive belt in turn. The belts have progressively finer abrasives and are wax-impregnated to reduce harsh cutting action and prevent scratch lines. Final buffing belt produces polish on edge of dinnerware.

Write us for engineering details and price data.

J. M. NASH COMPANY

Dept. 116 — 2370 No. 30th Street **Milwaukee 10, Wis.**

Machine Guard

FORMED of Royalite styrene copolymer, machine guards are designed to protect workers from the drive belts on such units as drill presses or lathes. Originally developed by Bassons Industries Corp., New York, N. Y., for use on their own machines, the guards are now available for installation either by machinery manufacturers as part of the original equipment or in individual plants as replacement parts or as safety accessories.

The formerly used steel or cast iron models, which the styrene copolymer guards replace, had several limitations. They were heavy, tended to rattle from machine vibration, and when accidentally struck by heavy objects or dropped on the floor during servicing, they would break, dent, or crack.

In contrast, the formed copolymer guards, which are less expensive than the metal ones, can take drops, knocks, and bumps without any damage. They will also absorb the vibrations of a machine without rattling and, because of their light weight, are much easier to handle by operating and maintenance personnel.

The part is formed from ⅛ in. thick Royalite sheet stock, heated to about 300° F. A single-cavity mold is used in an air-cylinder press, requiring a 5-min. cycle. As an additional safety measure, the guard is molded in bright green, blue, grey, or red, to call the attention of the operator to the presence of the guard on the machine.

In assembling the guard to a machine frame, the unit can either be attached by a metal hinge, cemented directly to the metal, or attached to a flange by means of bolts.

Lightweight formed styrene copolymer machine guard is easily installed

PURE
WATER WHITE
LOW IN ACID
UNIFORM STRENGTH
LOW METAL CONTENT

Designed to meet your highest requirements—

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PLASTICS MANUFACTURERS can depend on Du Pont Formaldehyde as a consistently fine raw material. It's produced under controlled conditions that assure uniformity and high quality in every shipment.

STANDARD CONTAINERS are used for shipments of Formaldehyde, Paraformaldehyde, 95% minimum strength, and Hexemethylenetetramine—Technical.

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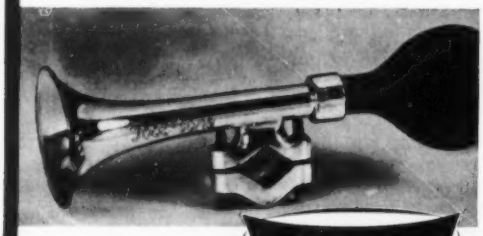

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Production & Quality Up, Rejects Down With Speed-Trols

Mr. W. J. Johnson, President of Modern Plastic Machinery Corp., leading manufacturer of plastic processing equipment, states that highly versatile, dependable Speed-Trols increased production due to wide speed range, less maintenance and down-time; reduced rejects and improved quality because of accurate, positive speed regulation; saved 20% floor space because of compactness.

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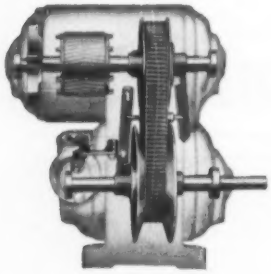

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Infinite speeds—positive speed regulation—fingertip control—large indicator—positive pulleys—no springs—belt tension in proportion to load—protected—streamlined—Herringbone Rotor—through ventilation—versatile mounting—NEMA dimensions—shock absorbing—quiet operation—rugged—compact—dependable—long life.

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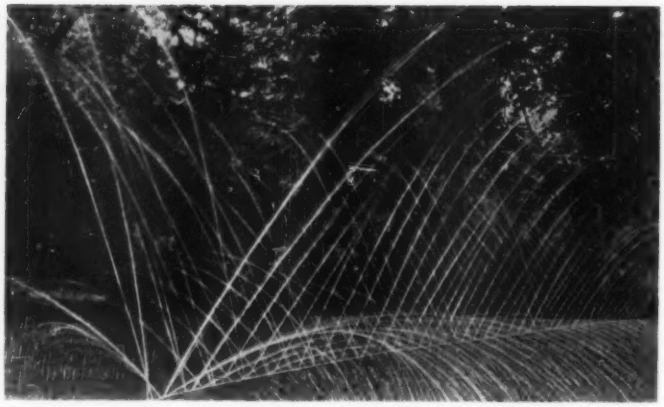
Plants: New York City 51; Chicago, Illinois; Los Angeles 22; Hamilton, Canada; Santiago, Chile. Offices and distributors in all principal cities.



Triple-tubed vinyl extrusion, with multiple groups of openings pierced at different angles (see drawing at bottom of page), does an efficient garden sprinkling job

Garden Sprinkler Extruded of Vinyl

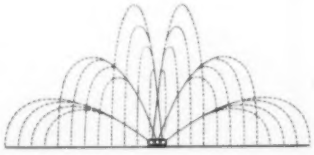
RUGGED yet flexible, a lawn and garden sprinkler made up of a triple-tubed vinyl extrusion is now being produced in 25- and 50-ft. lengths. Its comparatively heavy-walled tubes and rugged construction assure ease of handling and ability to withstand abuse. In addition, because it consists of three tubes side by side, the sprinkler is wider than it is high. It will therefore always lie flat when in use even when curved around irregular areas or up and down grades. Because the sprinkler has openings only on the upper side, its action cannot wash away seeds or loam.

This latest sprinkler, produced by Supplex Corp., a Div. of Industrial Synthetics Corp., Garwood, N.J., makes it possible to water an area of approximately 1000 sq. ft. with the 50-ft. length and approximately 625 sq. ft. with the 25-ft. length, using water pressure as low as 25 pounds. It is extruded of specially plasticized and stabilized vinyl compound and has multiple groups of tiny pierced openings equally spaced along the top side. Each group consists of two openings at an angle of 45°, two at 70°, and two at 88°. With this angular layout of the openings, the water will cover evenly the entire area being sprayed. Because three small tubes are used instead of one or two larger tubes, greater burst strength is attained with the same wall section. The underside of the sprinkler is ribbed and is not pierced.

Although precise details of the hole piercing technique cannot be revealed, it can be said that one piercing machine handles two sets of sprinkler extrusions at the same time and that the holes are pierced while the vinyl material is still hot. The openings are produced by a series of accurately sized piercing needles which pass through a solvent bath just before they are forced through the extruded tubes. The solvent acts to seal the edges of the holes, thus making them much more tear resistant than they would be otherwise.

At the present time, Industrial Synthetics is turning out 20 thousand sprinklers per day and reports that the backlog of orders continues to increase. The manufacturer states that he has an exclusive license for the production of this multiple-tube unit under U. S. Patent No. 2,621,075.

Uniform coverage of garden or lawn is assured by different angles of spray



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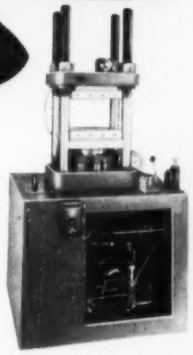
with **ADJUSTABLE HEAD and POWER RAM RETURN**

Features rapid advance and slow pressing speed—adjustable crown for varied heights of daylight openings—special "V" packed ram. Also available; gravity return platen—pressure regulator—motor shut off for long cure cycles (with no resultant pressure drop).



M & N MODEL—0326

STANDARD CAPACITIES (TONS)	25	50	75	100	150
STANDARD PLATEN SIZES (L-R)	12"	14"	16"	20"	24"

Your inquiry is invited for standard or special size requirements.

M & N HYDRAULIC PRESS CO.

Compression Press Division

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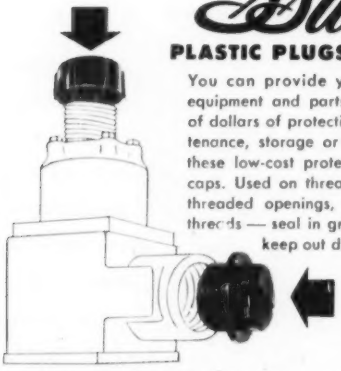
STOP COSTLY DAMAGE

with these inexpensive

S.S.White

PLASTIC PLUGS *and* CAPS



You can provide your expensive equipment and parts with hundreds of dollars of protection during maintenance, storage or equipment with these low-cost protective plugs and caps. Used on threaded studs or in threaded openings, they safeguard threads — seal in grease and oil — keep out dirt and moisture.

WRITE FOR BULLETIN P-5203

It has full details on the many sizes and styles of S.S.White plastic plugs and caps.

THE *S.S.White* PLASTICS DIVISION

DENTAL MFG. CO. — Dept. M, 10 East 40th St., NEW YORK 16, N. Y.

WESTERN DISTRICT OFFICE: Times Building, Long Beach, Calif.

There's a **BIG DIFFERENCE** in Plasticizers, too!

NEW!

RC PLASTICIZER 0-16 DIFFERS FROM MOST FATTY ACID ESTER PLASTICIZERS IN POSSESSING:

1 **Resistance to Oxidation and Rancidity!**

2 **Low Acidity!**

3 **High Degree of Water Insolubility!**

4 **Excellent Electrical Properties!**

Now commercially available, RC PLASTICIZER 0-16 (ISO-OCTYL PALMITATE) is a saturated lubricant-type secondary plasticizer for Polyvinyl Chloride.

Specify RC PLASTICIZER 0-16 and you'll find a *big* difference if your product is one of the following:

Film and Sheeting
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RUBBER CORPORATION OF AMERICA ALSO SUPPLIES THESE OUTSTANDING PLASTICIZERS:

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they can now "insure uniformity of weight in all runs of genuinely watermarked Atlantic Bond." If weight control is a problem in your sheet processing operation Tracerlab Beta Gauges can do the same for you.

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Tracerlab Beta Gauges are now cutting costs and increasing quality in many sheet processing plants . . . paper, rubber, floor and roof covering, plastic, tape, laminated products, metal foils . . . and on many special materials. Both Absorption (as shown) and Backscatter gauges, were pioneered and **first** made available to industry by Tracerlab.

ASK for FREE booklet "Tracerlab Beta Gauges"

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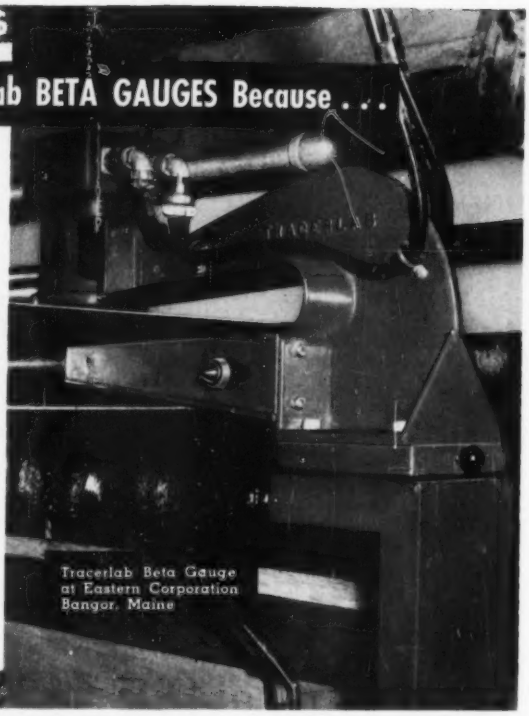
Absorption and Backscatter Gauges $3,300



Tracerlab Beta Gauge at Eastern Corporation Bangor, Maine

BIG THINGS are happening in POLYETHYLENE

for instance, this two-piece carboy, molded by A. L. Hyde. Presses 4 oz. to 200 oz.

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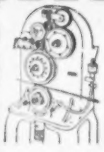
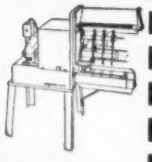


INKS AND MACHINES



Acromark Inks for printing plastic products and materials were specially developed by our chemists. Our ink makers and our marking machine builders work closely together. The printing machines indicated above are "The No. 683 Insulated Cable Marking Machine" and "Hopper Feed Plastic Rod Printer".

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The ACROMARK Company
5-15 MORRELL ST., ELIZABETH 4, N. J.

Rocket-shaped handle of molded styrene space kit doubles as a flashlight

Space Toys

LATEST additions to the multiplying number of children's toys designed to appeal to the space flight fancies of the younger set are an interplanetary space bank and a space emergency kit.

Both of the toys, each of which weighs approximately ½ lb., are injection molded by Regis Plastics Corp., Beverly Hills, Calif., using Dow's high-impact styrene.

The interplanetary money saver—a large-size piggy bank in stellar garb—has a slotted, rocket-shaped plunger into which coins are inserted and then pushed into the bank. Money can be removed through a hinged opening in the side of the bank opposite the plunger.

The double-drawer emergency kit is carried about by a handle, also rocket-shaped, which doubles as a signal flashlight. A guide to the International Morse Code is molded in raised letters directly into the inside surface of the lid of the kit for speedy reference.

Plunger is used to push coins into colorful molded styrene space bank

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PATENT APPLIED FOR

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2. No adhesives or binding agents needed, as in laminated papers.

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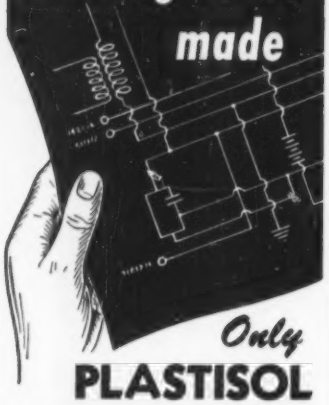

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LACQUERS JAPANS SYNTHETICS ENAMELS

Styrene Copolymer Camera Enclosure

THE sound deadening qualities of styrene copolymer are put to effective use in a movie camera enclosure whose function is to smother camera noise so that it will not be picked up on the sound track—even when working as close as 3 ft. to the subject.

The unit, which is known to the motion picture industry as a "camera blimp" was developed by the Raphael G. Wolff Studios, Hollywood, Calif., in conjunction with Richardson Camera Co., Hollywood, Calif., and was especially designed to reduce the noise level of Richardson's Maurer 16-05 camera when in operation.

The structural shell or housing of the unit is fabricated from formed sections of Royalite styrene copolymer sheet material. Royalite was selected for this application because it met the requirements for a durable, lightweight, and sound smothering material that could easily be fabricated into a completely finished unit.

In operation, the camera is locked securely in place on the base of the unit and the hinged cover is closed down over it. In addition to the camera, the enclosure also contains a special follow-focus mechanism which permits accurate focusing for objects in motion as well as for close-up work.

Set into the front of the blimp is a set of clear glass windows, which permits operation of the lens and focusing systems even when the shroud is entirely closed. The focus control unit is isolated on the inside of the blimp with a leather-faced coupling running to the camera focus control shaft. A control knob is located on the outside of the blimp so that the cameraman can focus without having to open the enclosure.

Camera enclosure, fabricated of styrene copolymer, smothers operating noises

Hinged cover facilitates access to the camera unit locked to base of enclosure

The formed Royalite sections are cemented together and the interior of the blimp is further soundproofed with expanded Royalite, attractively covered with corduroy material. A rubber grommet around the opening of the blimp acts as a seal when the cover is closed.

Both base and cover sections of the device are reinforced with an aluminum frame which provides additional strength and support for the cover hinge.

The camera mounting base is a steel plate cemented to the inner base of the blimp with a ½ in. thick pad of neoprene sponge rubber between the two. There is no metallic connection between the camera unit and the blimp.

A recess is engineered into the lower base of the blimp to receive the viewfinder when the camera is opened for film threading. An aluminum alloy plate rubber bonded to the bottom of the blimp provides a firm support for the entire unit when mounted on a tripod, camera dolly, or platform.

The unit is designed with a convenient carrying handle in the front and two equally handy carrying handles in the rear for greater ease in transporting it.

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VISCOSITY

As Simply, Quickly and Easily as Taking Temperature Readings

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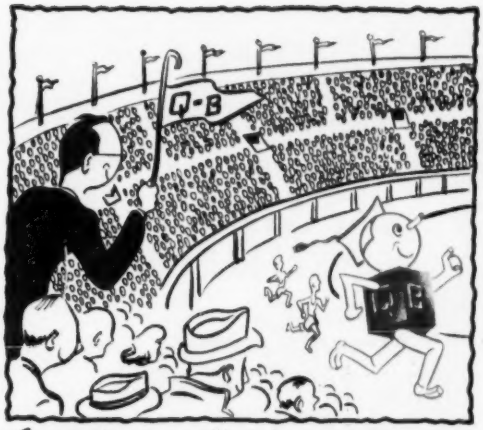

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"Cubee" does a complete job . . . when you use our services you get the benefit of the *entire* organization working on your problem — designers, die makers, molding machine operators—everyone. You see, we have all the services available to you to help you solve your problems.

Five of the key people here have a total of more than 75 years of experience in this business—and remember this is a relatively new field. That's a lot of know-how—and it's yours for the asking. Let "Cubee" take over *your* plastics problems—from Start to Finish.

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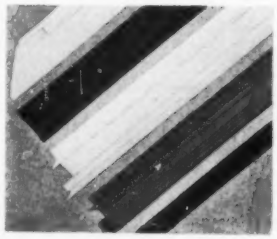
THE S & F SHOWCASE



These intricate extruded strips, made of ethyl cellulose or modified styrene, have excellent low temperature properties. They are used to separate inner and outer walls of freezers, coolers, etc. Extrusion by Schwab & Frank, Inc., Detroit, Michigan.

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MANUFACTURERS AND CUTTERS OF WOOL FELTS

Rod and Reel

THE wooden stick and bent pin that have long symbolized the young fisherman are on their way out.

Today's juvenile anglers now have at their disposal such modern, up-to-date equipment as the fibrous glass-reinforced plastics rod with molded styrene handle and reel recently introduced by Champion Products Co., Muskegon, Mich.

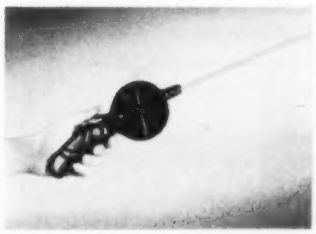
The 36 in. long Junior-Rod is an exact replica of the rod that Dad might use—and offers the same advantages that have made the reinforced plastics fishing rod so popular with Dad. The Fiberglas section of the Junior-Rod is light in weight, flexible, rugged, and unaffected by exposure to the elements or, equally important, to salt water.

The molded styrene combination handle and reel also has many desirable features. For example, at the top of the sturdy "pistol-grip" handle is a thumb-operated brake that stops the line at the end of a cast or prevents it from unreeling while still fishing.

In addition to these advantages, the design of the reel is such that the line is prevented from becoming tangled because it is fully enclosed in the circular reel. When the line has to be replaced, the reel is easily opened by prying the flat face of the reel off a molded-in lug.

The handle and reel are molded in a 5-cavity mold by Chili Plastics, Inc., North Chili, N.Y., using Monsanto's medium-impact styrene. As added appeal to the youngsters, the styrene parts are available in three different colors—brown, green, or maroon—that will not wear off even after long use.

Reinforced plastics fishing rod for children has styrene reel and handle



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Advantages of Logan Multiple Press Installations

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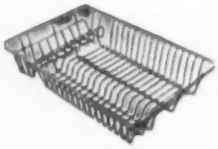
VINYL PLASTISOLS



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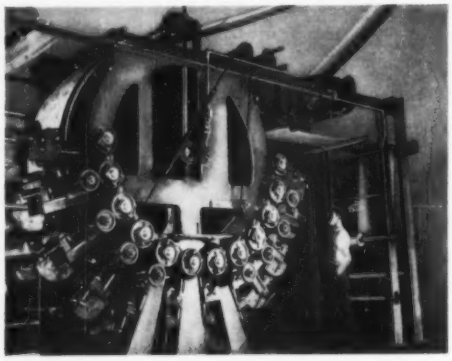

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Molded styrene infant trainer consists of contoured seat set on a deep base

Trainer

AN improved infant trainer, molded of medium-impact styrene, can be adapted both to the sit-down toilet training of girls and smaller boys and to the stand-up training of older boys. The basic unit of the trainer, which is manufactured by Pemco Products, Inc., Indianapolis, Ind., is a removable contoured seat set on a deep base. For small boys, a molded Vinylite deflector is snapped onto the front of the seat; for older boys, a styrene urinal shield is attached to the back of the seat.

The highly-glazed styrene parts, molded in white by Amos Molded Plastics, Edinburg, Ind., are non-staining and easy to clean.

For stand-up training of older boys, a styrene shield is added to the unit

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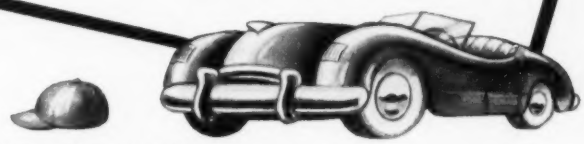

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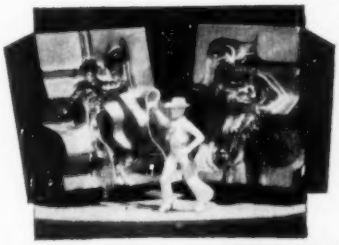

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IN USE EVERY DAY . . .
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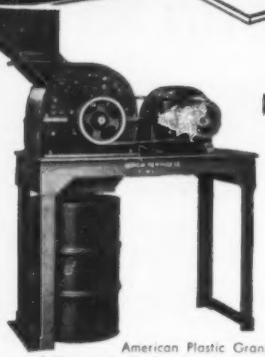

In the past year, this American KC-9 Rotary Knife Plastic Granulator, installed at a large St. Louis plastic molding company, has regranulated over 200,000 pounds of plastic scrap to a homogenous granulation . . . at a rate of up to 1500 lbs. per day. (Short scrap is being run through at an average of 300 lbs. per hour.)

American Plastic Granulators—available in two sizes, 9x9 and 9x12—are built for the heavy-duty demands of constant, tough usage. Size, shape, or kind of plastic is no problem for this sturdy machine. The clean, shearing action of the adjustable rotary cutter blades of fine tool steel, provide fast, once-through regranulation.

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A variety of phenolic impregnated unidirectional glass fabrics for the manufacture of high strength tubular glass fishing rods is included in the Phenopreg line of resin impregnated products. Two basic fabric weaves permit construction of all types of rods, from deep sea casting and trolling rods to light weight spinning and fly rods. A special resin formulation, which may be adapted to custom specification, is used. Impregnated characteristics can be tailored to suit varied fabricating conditions and special problems.

Inquiries about these and other special grades of Phenopreg laminating and molding materials are invited. Ask for a sales engineer to assist with your technical problems, or send us details of your problem.

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Canadian Representative: Plastic Supply Company, Montreal, Toronto

FABRICON

"Think" Machines

(*Continued from pp. 75-80*)

ers to date, other companies are not far behind. National Cash Register Co. has announced its CRC 105 decimal digital differential analyzers and CRC 102-A general purpose electronic computers, both of which, though relatively small, contain large quantities of plastics of the same general types as are used in the machines discussed above. Coming right along with further developments are Bell Laboratories, Burroughs Adding Machine Co., and Raytheon Mfg. Co. In the development of digital computers at more academic levels are the National Bureau of Standards, Harvard, and Massachusetts Institute of Technology.

Analogue Computer

The analogue computer is best exemplified by Typhoon, the latest RCA model, formerly at the Sarnoff Research Laboratories at Princeton University and now in the hands of the Navy Department. The Typhoon succeeds the Sirocco, the Zephyr, and probably others similarly named by a wind-storm minded military authority. To date the Typhoon has been used largely for calculation and test work on guided missiles and ordnance. In the Typhoon, a tiny exact scale model of a guided missile in a control station simulates the actual flight of the missile and the machine is capable of computing its exact trajectory as well as that of its target at speeds faster than those at which missile and target are traveling. If, for example, a missile is traveling at 2500 feet a second, Typhoon is always several feet ahead of it.

Typhoon may also be fed information and instructions by means of knobs and dials; output is in the form of plotted curves (as a missile in space) and readings on registers. Memory is by mercury delay, by cathode ray, and by the mathematical function of a mechanical device such as the rotation of a shaft, but there is not the need in the analogue computer of the tremendous storage required of a digital device. Being electronic in function, Typhoon contains many, many thousands of plastics components and

many, many miles of plastic coated wire.

Between the analogue and the digital computer might be placed the digitron, which is the creation of the Servo-Mechanisms Laboratory at M.I.T. This unit is fed mathematical formulas coded on a tape and it is capable of directing various machine operations.

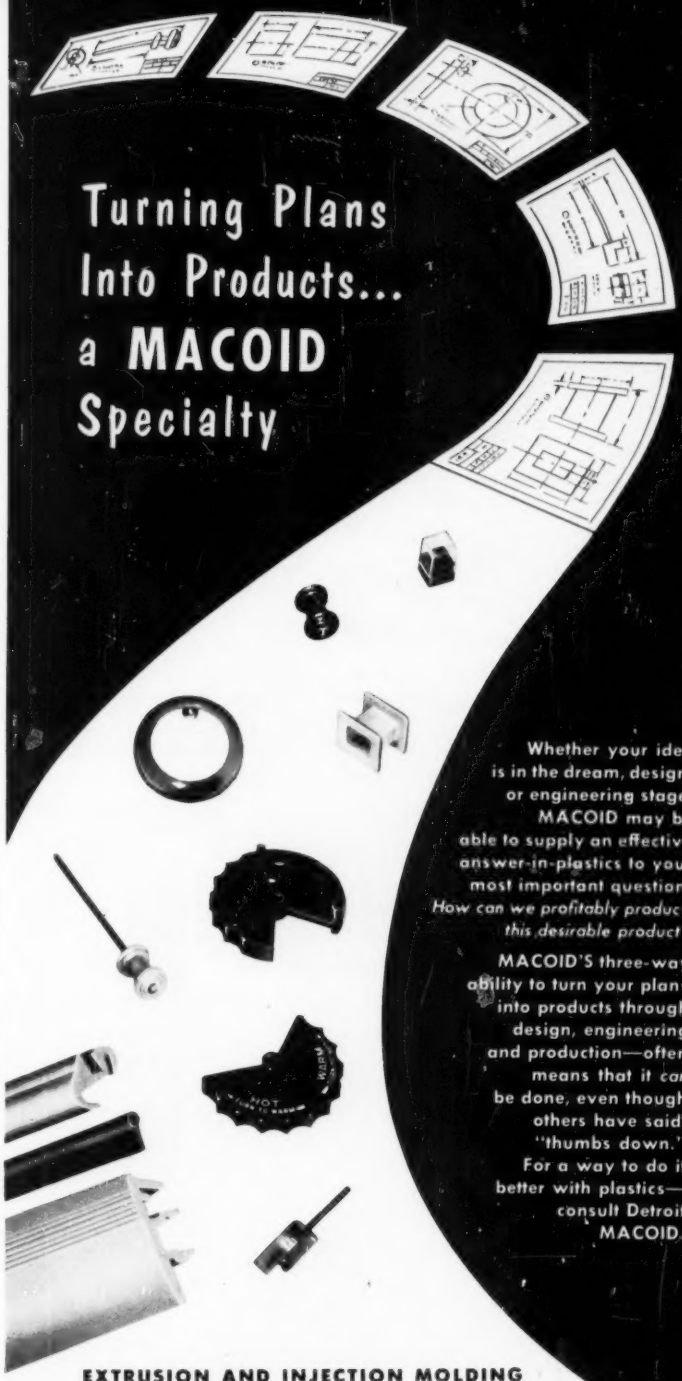
Other "Thinkers"

Related to both digital and analogue computers is the colossal alternating-current network analyzer being built in the Franklin Institute in Philadelphia by Westinghouse Electric Corp. for seven major power companies in Delaware, New Jersey, and Pennsylvania. This unit, which will cost $400,000, is expected to be finished late in 1954 and is actually a power system in miniature with a scale factor of 1 to 100,000. Its maze of circuits represents generators, transmission lines, transformers, and loads. Sitting before it, the operator may analyze any circuit or possible circuit by connecting up elements in imitation of any given power system. The network analyzer will have 580 separate circuits, more than 20 miles of plastic covered wire, 152 indicating instruments, and thousands of plastic components.

For analogue-to-digital conversion Consolidated Engineering Corp. has produced the Sadic. This device automatically measures physical phenomena (stress, strain, pressure, etc.) in numerical form and permits digital methods to be used to prevent loss of accuracy from analogue data being passed from one instrument to another.

As science progresses toward the necessity for calculation beyond the capabilities of human brains in the time in which they must be done, as business progresses toward the automatization of routine calculation, as industry progresses toward the total elimination of unnecessary supervision of machines by humans, machines that "think" will be given more and more work to do. This is all part of a new industrial revolution, a part of the process of freeing mankind from unnecessary and dull routine.

And plastics are there—as usual, key materials in a revolutionary development.—END



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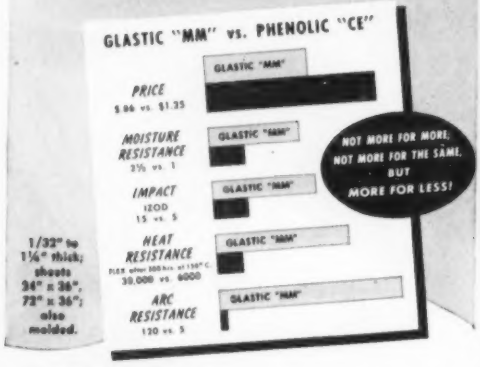

Illustrated above are typical parts, some of them difficult, which are punched or machined with ease and profit from Glastic reinforced polyester sheet.

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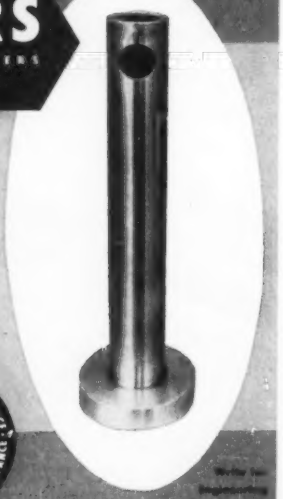

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Battle Armor

(*Continued from pp. 96-97*)

tially effective against short range small arms fire and will usually stop a bayonet.

The original flak suit was composed of over 30 layers of nylon stitched together. The guts of the armor vest now issued to GIs are 12 layers of lightweight nylon duck fabric conforming to Specification MIL-C-12369. The layers are now bonded instead of being stitched. The bonding resin is a formulation consisting of equal parts of a phenol-formaldehyde resin and Hycar rubber in methyl ethyl ketone. Other resins may also be used. The cut edges of the nylon layers are fused or coated with an adhesive to prevent fraying.

Many types of fabrics (including all the synthetics) and resins have been tested for this project, but nylon has always remained the most satisfactory.

Production Steps

In the manufacture of the Quartermaster Corps' vest, the nylon duck cloth is scoured, heat set at 300 to 350° F., and cut to pattern. It is then sprayed, roller-coated or silk-screened with the bonding resin, layer by layer, and placed in any ordinary laminating press where heat and pressure is applied. A press no larger than 3 by 2½ ft. is sufficient. It is not a difficult operation—mass production is definitely possible.

While the laminating operation is comparatively simple, it does require a certain amount of study and experimentation to overcome problems of impregnation; prevention of shrinkage; securing adequate bond strength; and complying with ballistic requirements. Victory Plastics Co., Hudson, Mass., and General Textile Mills, Inc., New York, N.Y., have done most of the laminating. The assembly job of the complete vest is performed by L. W. Foster, Philadelphia, Pa., and Textron, Inc., Providence, R.I.

Before the 12-ply laminate is assembled into the outer nylon jacket, it is encased in a 4-mil vinyl film which must conform to Specification MIL-F-10400, except that the tensile strength shall be not less than 1600 p.s.i., and a more severe stiff-

ness test at low temperatures must be passed than in the regular specifications for vinyl film.

The vinyl envelope is necessary to prevent water absorption by the laminate. When so encased, the nylon laminate must not absorb more than 5% by weight of water after 24 hr. immersion at 73.5° F., ± 2°. Government technicians are still not satisfied that presently procured vinyl film is tough enough and are hopeful of securing film that will have more strength; or it is even possible that some way may be found to fill the interstices of the nylon and thus make it water-resistant.

The outer covering of the vest is 3-oz. nylon Oxford. The garment is made in three sizes—small, medium, and large—and protects the body from shoulders to hips.

A groin armor, dubbed a diaper by GIs, and made of the same nylon material, is now on test by all services, including the Marines, to give men in combat or on patrol the benefit of protection of the groin and hips.

The materials used in the vest include the outside nylon duck covering; about 9 yd. of 48 in. wide nylon for the laminate; approximately 1½ yd. of 48 in. wide, 4-mil vinyl film; about 2 oz. of phenolic-Hycar resin at dry weight; two phenolic or melamine buttons, a little over ½ in. in diameter; laces for fastening front and back together, which are tipped with a small amount of cellulosic material; about ¼ sq. ft. of Neoprene, ¼ in. thick, for shoulder pads; various snaps, webbing, and thread; and a zipper.

The complete nylon armor vest weighs 7¾ lb.; the groin armor weighs 4¼ pounds.

The Army Quartermaster Corps has already, or is now procuring, about 50,000 of these nylon armor vests at a cost of from $30 to $40 per suit.

Coldbar Suit

Among other plastics projects of the Army Quartermaster Corps is a strange sort of suit with which QM officials have been experimenting for several years. This is the Coldbar suit for use in cold, wet weather. It is made from U. S. Rubber Co.'s Ensolite, an expanded blend of vinyl chloride and synthetic rubber. The flat sheet material is

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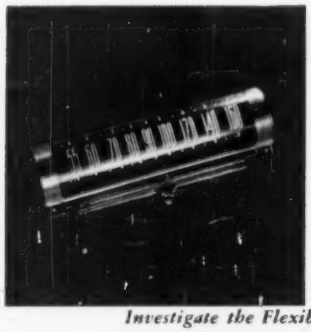

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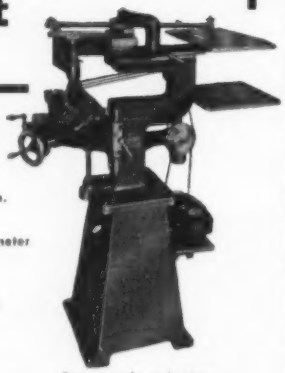

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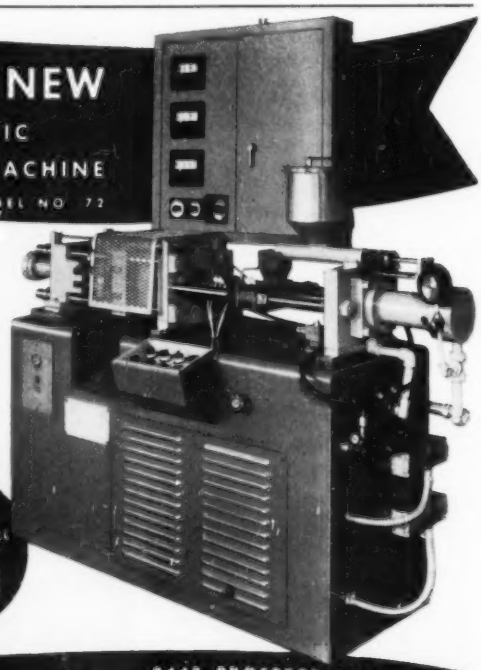

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molded with small bumps or bubble-like raises on the surface and is then cut and formed into undergarments. The bumps are on the surface next to the soldier's body and permit circulation of air between the body and the plastic under-garment. Only a thin outergarment needs to be worn over it. Over 2000 of these Coldbar suits are under test.

The suit is designed to be worn in a cold, wet atmosphere of approximately −20 to 50° F., and in alternately freezing and thawing temperatures. It is not designed for general purpose use, but may be worn by Signal Corps linemen, helicopter pilots on patrol duty, during amphibious operations, and for similar special purposes. It is buoyant in water and has the plus value of shock resistance that would make it helpful for parachute drops. Men have remained in 33° F. water for over 20 min. without ill effect while clad in this suit. The normal time a man can spend in such cold water without adverse effects is only 5 minutes. One suit—jacket and trousers—requires about 5½ lb. or one cu. ft. of material. Cost at large-scale procurement is estimated at about $40 per unit.

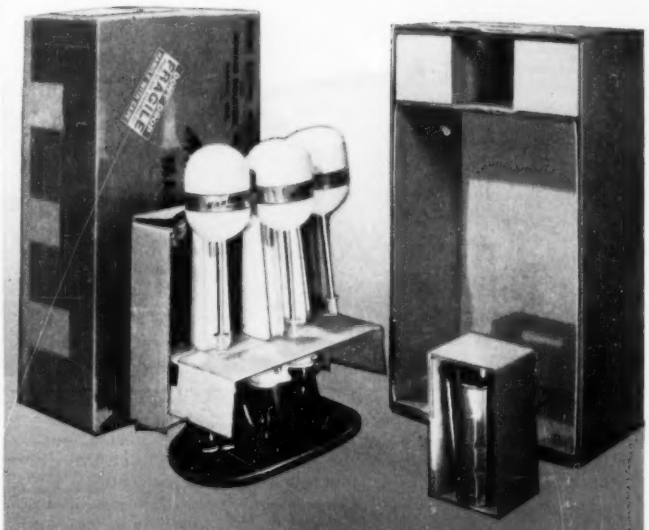
The Army is also experimenting with mittens made from this same material, but test reports are not yet available.

Limitations

Another suit for dry, cold weather is also wanted by the Army. Because of material limitations, the present Coldbar suit cannot be used in the arctic regions where material that will withstand -65° F. is needed, but it is possible that the structural ideas applied to the Coldbar can be used in designing an arctic suit.

The present Coldbar suit, while rated as a big step forward in the development of clothing for adverse weather conditions, has not yet reached perfection. Its exceptionally good insulation value is in some cases a handicap because a man wearing it would become quickly overheated at higher temperatures. Since a man cannot take off his underwear as he does his overcoat when he enters a hot room, there must be limitations in use of the present Coldbar suit. Furthermore, it has relatively poor resistance to snags and cuts and thus requires

An H&D idea for you



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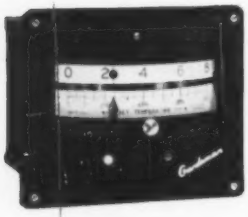

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Model JP proportioning controllers produce consistently uniform products, eliminate waste, reduce manufacturing costs for injection moulding, extruding and packaging. West's magnetic amplifier eliminates all adjustments and tube replacements. When you want extreme accuracy with reliability of control at reasonable cost, specify Gardsman temperature controllers by West.

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use of a light herringbone fabric over the plastic garment. A material with better tensile strength or more elongation and one which would permit construction of pockets would be more desirable.

Clothing Possibilities

Nevertheless, development of the present Coldbar suit opens a door to the Army's clothing field for plastics where they have not made much progress heretofore. A liner for arctic clothing might be one possibility. The factors of non-wettable insulation, light weight, low heat conductivity, and unicellular construction with 90% voids, are properties much sought for in specialty clothing.

In addition to the items named above, the Chemical and Plastics Branch of the Research and Development Div. of the Quartermaster General's Office is working on scores of plastics projects with a view of having them ready when needed. Many of them have been mentioned in MODERN PLASTICS; others are just beginning to sprout. The remainder of this article gives the current status of some of the projects about which information is available.

After two years of development, plastic grommets for tentage are still uncertain. Grommets produced from most metals corrode and the Army is anxious to use non-corrosive plastics. A styrene copolymer is in the lead for this job at the moment, but details have not been perfected. A thermoplastic material is desired so that it can be swedged and otherwise used with existing tent making equipment.

Tests and experiments on a phenolic impregnated canvas pack board have been sufficiently satisfactory so that it may now be considered as an alternate for the standard plywood pack board. The plastic pack board is lighter in weight and less costly. A pack board is used to strap on a man's back so that he can carry 5-gal. cans of gasoline and other cumbersome loads.

Something like 3 million cellulose acetate tray liners have been purchased. They are used in conjunction with 6-compartment trays, but only by medical troops on trains and planes where washing facilities are unavailable. The Army also thinks that the price of approximately 12¢ each is too costly. The often proposed expendable tray for issue

with rations does not seem to be getting anywhere at present.

About $6 million worth of melamine dishware has been procured, with a few contracts still not completed. Contrary to the condition of a year or so ago, there now seems to be a surplus of the rag-filled melamine used for this job.

There are a number of fibrous glass-polyester items in the Quartermaster's inventory, but procurement has been limited. In most cases, the glass projects are designed as alternate materials to be used primarily in event of a metal shortage. Therefore, after design and tests have been approved, the item may be laid on the shelf awaiting the time when it is needed.

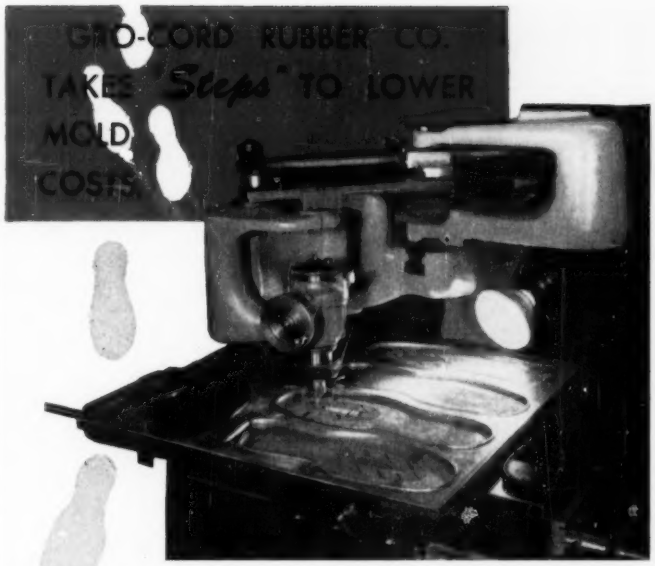
Fibrous Glass Projects

Among the fibrous glass-polyester items in inventory are sleds for arctic transportation, of which 23,000 have been purchased. This is an item which is supposedly superior in construction to any other that has been tried. It is lighter than plywood, has built-in color, and good abrasion resistance.

About 70,000 resin-glass bread boxes have been procured. They are $22\frac{5}{8}$ by $16\frac{7}{8}$ by $10\frac{1}{2}$ in. high and cost the government from $8 to $12 each. The specifications call for $\frac{3}{4}$ oz. per sq. ft. fibrous glass mat or its equivalent. The weight of the completed box with hardware is 9.25 pounds. It is used to carry 25 garrison loaves of bread from bakery to mess hall and has replaced wooden boxes which were generally built on the spot by post carpenters.

A few experimental lockers are still on trial, but it is probable that a cross between a trunk and a box will be designed in order to save cost. Things like this can drag on forever—especially in a so-called cold war. The end result may be no locker at all.

There are many, many other plastics items now being studied by the Quartermaster Corps. Nothing has been said here about buttons, packaging, plastics-coated fabrics, raincoats, vinyl-coated nylon ponchos, vinyl-coated fibrous glass for acid-resistant suits, and scores of other items; but the samples briefly described indicate that Uncle Sam's Quartermaster is well aware of what the industry can do in war time.—END



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Primary Structures

(*Continued from pp. 89-90*)

most all instances require close tolerances, the use of matched steel dies was indicated.

Preliminary tests indicated that an increase in laminating pressures was accompanied by both improved and more uniform physical properties. Hence, in addition to the use of matched steel dies, high pressure laminating was also indicated.

As a further result of these tests, it was found that a higher curing temperature could be used with a subsequent reduction in cure time. For example, one part which was originally molded at 50 p.s.i. and a temperature varying from 250 to 325° F. in 90 min., is now being molded at 2000 p.s.i. and 340° F. in 4½ minutes.

One of the major difficulties encountered in our development effort was the inability of our designers to design for fabrication of plastics materials. This was due to the fact that the major portion of their work, until now, has been confined to the design of metallic structures. This has been overcome to a large extent by close liaison between the fabricating, design, and structures groups. This close cooperation was instrumental in the development of the plastics parts shown in Figs. 1 and 2 for use as primary structural members.

Another great difficulty was our inability to find molders willing and able to fabricate parts to rigid specifications. This, too, is being overcome by the distribution of small pre-production orders and close liaison with the molder.

As a result of our work for the past three years with plastics materials, the fact has been indelibly impressed upon us that the continued and expanded use of these materials in the aircraft and guided missiles fields is contingent upon the dissemination of data such as we have compiled.

It is highly problematical that very many companies will engage in a program as extensive as that outlined. It is also obvious that no single supplier or fabricator is in a position to obtain these data independently. It is therefore up to the S.P.I. to spark a program that will benefit the entire industry.

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Motors

(*Continued from p. 90*)

are, of course, of concern to the designer, the physical properties of the current reinforced plastics do not compare favorably with those of the metals now in use. Because of the low initial tensile strength and the drop-off in strength with temperature, unusually heavy walls are required. This causes the plastic chamber to weigh nearly as much as the metal chambers. In addition, the Young's modulus of the current reinforced materials is so low that the containment of end-closures to maintain the pressure within the chamber is a major problem. Furthermore, current reinforced plastics are often porous at pressures above 200 p.s.i. A reinforced plastic that could be made to the following specifications would be eagerly sought and bought by the rocket designer:

Minimum yield at 600° F. . . . . 70,000 p.s.i.

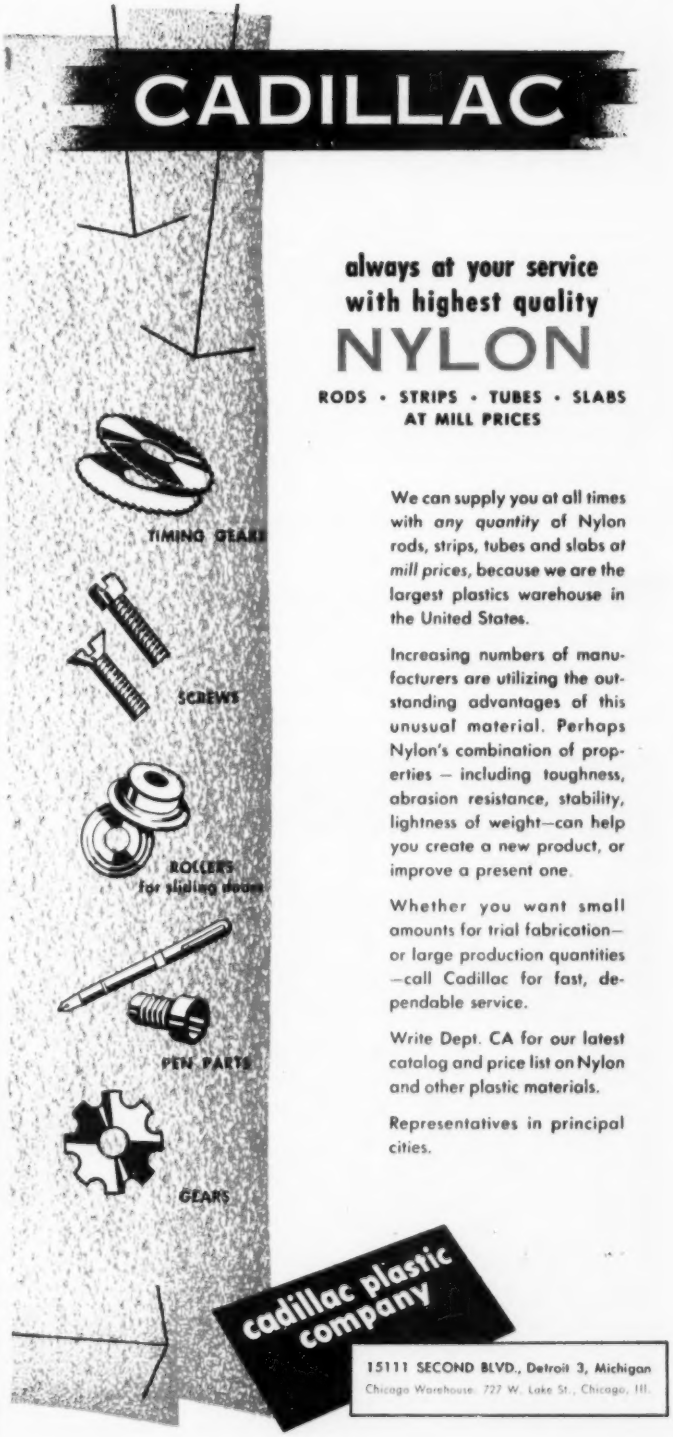
Minimum modulus of elasticity . . . 4×10^6 p.s.i.

Non-porous at 1600 p.s.i. hydraulic pressure.

Thermal expansion . . . as near to steel as possible.

The prospective use of such a material would appear to be unlimited. One rocket model alone, now in production, would use over 125 tons per month of reinforced plastics if the current chamber parts were manufactured from such a material.

The particular property of low thermal conductivity of plastics has especial value in the field of rocketry. This property has led the guided missile motor or rocket designer to employ plastics as insulating media. The thermal conductivity of plastics is only a fraction of that of propellant or of structural metals. When it is considered that plastics weight is about one-third that of the usual metals used in the construction of rocket motors, it can readily be shown that considerable weight may be saved by using a plastic insulator for metal components. Because of its high thermal conductivity, steel, for example, is rapidly heated to temperatures at which it loses much of its strength. By inserting a plastic sleeve insulator, the steel part may



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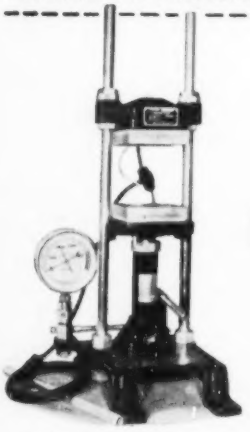

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be kept at a temperature where most of its strength is retained.

Recent trends are towards guided missile motors of larger size and greater burning duration. Both of these conditions considerably aggravate the chamber-weight problem. In the design of a recent large rocket take-off motor, the use of a plastics insulating sleeve allowed the insulated chamber assembly to be approximately 70% of the weight of a similar design employing an uninsulated chamber. When it is shown that this represents a substantial weight reduction on an airborne item, the importance of such a plastics application is apparent. A smaller rocket motor now going into production will use an insulating boot of reinforced plastics. This application alone will require several tons of reinforced plastics per month. The use of plastics insulating materials in guided missile and rocket motors is certainly on the increase.

Some of the more recent developments in rocket applications lie in the field of high-pressure molding of glass reinforced phenolic resins. Many small non-structural items have been constructed in this fashion. The promise of light weight, good reproducible physical properties, and high production rates has encouraged the rocket engineers to invest in the relatively high-priced tooling necessary to produce high pressure molded parts.

The items currently fabricated in this manner are non-structural in nature, being used within the rocket as gas deflector shields, insulating boots, and grain-support rings.

The use of high pressure molding techniques for more components is limited because of the random nature of the reinforcement. If strengths were available in molded structures as required and as found in directed-laminated pieces, many additional items would be made in this manner. Currently, studies on larger components are in progress, in which the orientation of the reinforcement medium is being controlled in a hand lay-up pre-form, and the final strength and dimensions reached by a final high-pressure cure.

The use of molded reinforced plastics in rocketry has a very fine future.—End

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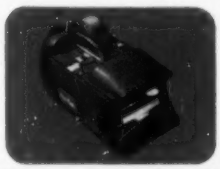

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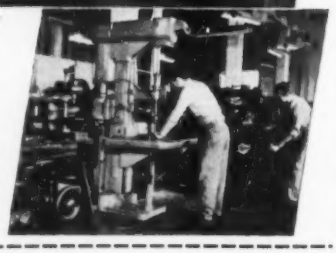

Lor-El

Refrigerator

(*Continued from pp. 81-83*)

the mold and the cycle continues until the basket is filled. Action of the mechanism automatically stops once the basket is full.

Design Possibilities

In the up-to-the-minute styling and durable construction of this refrigerator, the manufacturer has taken advantage of the properties and design possibilities of a variety of plastics. More than 48 plastics parts (see chart, pp. 82-83) contribute to the lightness, efficiency, and appearance of the Automatic Ice Maker. Included among the materials represented in this group are styrene, phenolic, vinyl, polyethylene, ethyl cellulose, cellulose acetate butyrate, melamine, acrylic, and polyester resin-impregnated fibrous glass.

Styrene materials—styrene copolymer, high-impact styrene alloy, and standard styrene—account for more than half of the plastics parts. Many of these are variations of similar pieces that have already found wide acceptance in previous models. But the introduction of Bakelite's C-11 styrene copolymer for molding the door pan shelves represents the first time this material has invaded the refrigerator market.

The 8-oz. shelves, measuring 22 in. long, 2½ in. wide, and 2½ in. deep, are attached to the inner liner of the lower door panel and serve as an extra storage convenience for small bottles, jars, cans, condiments, and left-overs. Each door pan shelf is molded by Kusan, Inc., Nashville, Tenn., on a 16-oz. Watson-Stillman. The over-all molding cycle is 1 min. and the molding temperature is between 580 and 660° F.

Because of the exceptional strength of the styrene copolymer, the studs which are molded into the shelves can be produced with a wall thickness equal to that of the shelf itself.

With most other materials, this wall thickness would have to be considerably greater. Originally, the studs were molded at the ends of the shelf for a snap fit into the inner liner, but difficulty was encountered in filling them out during molding. The mold was later changed so that the studs would be molded with

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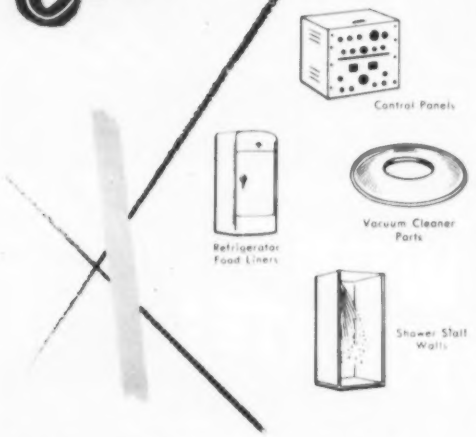

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holes that become self-threading when screws are inserted.

The natural gold tint of the material and its clarity were advantageous in improving the appearance of the unit. Gold paint sprayed on the underside of the styrene copolymer shelf gives a rich metallic luster.

Most other decorative parts of the refrigerator are similarly finished in gold—either back-painted or sprayed on the front of the part. Where this gold finish is exposed on the outer surface of the refrigerator compartment, it is given an additional coat of lacquer for extra protection.

The greatest number of refrigerator parts, with a total weight of almost 8 lb., are molded of standard styrene; second in volume, with a total weight of over 5 lb., are parts molded of high-impact styrene alloy. One of the largest of the standard styrene pieces is the evaporator molding, which includes the surrounding framework as well as the decorative front. This piece is back-painted with a handsome combination of blue, gold, white, red, and grey.

Selection of Materials

The function and distribution of the remainder of the plastics parts that are used in the refrigerator are indicated in the parts chart. Each of the many plastics materials which are put to use in the Automatic Ice Maker were carefully selected to do the best job for a specific application. Since much of the styling and operational features of the Automatic Ice Maker is a radical change from last year's model, many of these parts represent new applications. However, several plastics parts have been specifically selected as replacements for traditional rubber or metal parts. These include a reinforced plastic evaporator bracket substituted for a metal one and a vinyl extrusion used in place of rubber gasketing around the refrigerator door. The vinyl gasket is heat sealed at the joints to make it airtight.

Thus is Servel pioneering not only in the refrigerator field with its Automatic Ice Maker but also in plastics by its adoption of the newest materials and engineering practices. With such practical imagination at work, the future is wide open.—END

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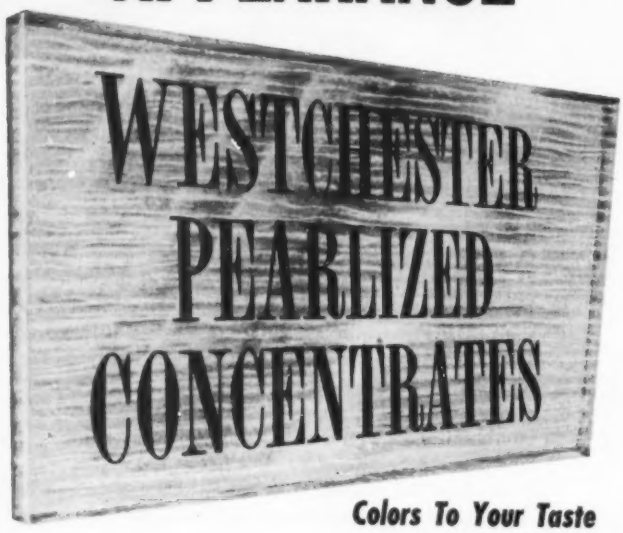

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Tests

(*Continued from pp.* 100-105)

film are preconditioned in an oven for 3 hr. at 50° C., placed in a desiccator, cooled to room temperature, and weighed. Each sample is then suspended in a separate jar filled with the soapy solution (Fig. 13). Jar and sample are heated in an oven for 24 hr. at 50° C., after which the specimens are removed from the soapy solution, rinsed in clear water, wiped gently, conditioned in an oven for 3 hr. at 50° C., replaced in the desiccator, and again cooled to room temperature. The samples are then weighed and this final weight compared with the first weight reading. The results are recorded as the percentage of weight loss in the sheeting.

Dimensional Change

It is not uncommon in the fabricating of vinyl sheeting to heat the material in order to soften it a bit more and ease its shaping to the contours of the end product. When a sheet is thus heated, any strains that may exist in the material are released. This can result in a shrinkage of the vinyl sheeting which, in turn, can cause a wastage of material. Heating of the sheet may, on the other hand, cause expansion.

To calculate the percentage of shrinkage or expansion that can be expected of a given vinyl formulation, two specimens of sheeting are placed on separate thin metal plates. The calendering, or long, direction of the sheeting is marked on each sample. Plates and specimens are heated in a 100° C. oven for 30 min., cooled for 15 min., and measured for change in dimensions. Figure 14 is a before-and-after picture in which the degree of shrinkage has been exaggerated for photographic purposes.

Flame Resistance

Tests to record the ignition time, burning time, length of char, flame temperature, and appearance of a vinyl sheeting after burning divide into six categories. There is the test for: 1) Vinyl sheet which burns readily. 2) Material which is slightly flame retardant. 3) Sheeting which is resistant to initial burning because of formation of a

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PLASTIC PIPE. Description of the advantages and economies derived by using "Walpipe" made of cellulose acetate butyrate or polyethylene. Data on applications for flexible and rigid plastic pipe. Waljohn Plastics, Inc. (H-303)

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COLORING ACRYLICS. Folder explains the techniques which the molder can use to color virgin and scrap acrylic resins as they are needed in his own plant. Ferro Corp. (H-307)

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DRY COLORING STYRENE. Data on how the proper selection of colorants, formulating methods, and blending equipment can improve the color uniformity obtained in dry coloring styrene molding materials. Monsanto Chemical Co. (H-310)

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NARMCO PUTTIES. Data on polyester and epoxy-based putties for use in caulking and edging sandwich-type plastic laminates. Narmco Resins & Coatings Co. (H-312)

SPECIALTY MONOMERS. Price list covers research quantities of more than 250 different monomers including allyl and diallyl esters, acrylates and methacrylates, and vinyl esters. Also lists catalysts and accelerators, cross-linking agents and monomers for polyelectrolites. Monomer-Polymer (H-313)

PRESSURE CASTINGS. Detailed information on the standard sizes of castings, hob specifications, heat treatment, machining, welding, soldering and brazing, pickling and plating of beryllium copper pressure castings. Federal Tool Corp. (H-314)

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AROMATIC HYDROCARBON DETECTOR. Bulletin on an easy-to-use instrument for determining when concentrations of benzene, toluene, and xylene exceed the safety limit. Mine Safety Appliances Co. (H-316)

FLEXIBLE SHAFT MACHINES AND ACCESSORIES. Catalog lists the various motors, handpieces, speed controls, chucks, burs, abrasive points, and polishing supplies manufactured by Foredom Electric Co. (H-317)

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WORKING WITH "PLEXIGLAS." "How to" booklet illustrates the basic methods of cutting, machine forming, sanding, buffing and doing other fabricating operations with "Plexiglas" acrylic sheet materials. Cadillac Plastic Co. **(H-339)**

KOPPERS MODIFIED POLYSTYRENES. Technical bulletin covers the characteristics and applications of Koppers modified polystyrenes, four of which are formulated for high elongation and high impact, and three for medium elongation and medium impact. Data on injection and compression molding, extrusion, and finishing. Koppers Co., Inc. **(H-340)**

SMALL HOLE DRILLING EQUIPMENT. Specification and data bulletin on the Hamilton "Varimatic" Super Sensitive Variable Speed Drilling Machine for accurate production-drilling of small holes in all drillable materials. The Hamilton Tool Co. **(H-341)**

"VOLAN" FINISH FOR GLASS FABRIC. Data on "Volan" methacrylato chromic chloride for treating glass fabric so it will bond more securely with low pressure polyester type resins to produce laminates with high flexural strength, particularly under severe moisture conditions. E. I. du Pont de Nemours & Co., Inc. **(H-342)**

ELECTRIC POWER DRIVES. Catalog contains complete descriptive information on the variable speed drives, geared motors, and constant normal speed motors in drip-proof, splash-proof, totally enclosed, and pipe ventilated designs manufactured by Sterling Electric Motors, Inc. **(H-343)**

PLASTICS EXTRUSIONS. Bulletin illustrates typical extruded sections and the facilities available for their manufacture at Sheffield Plastics, Inc. **(H-344)**

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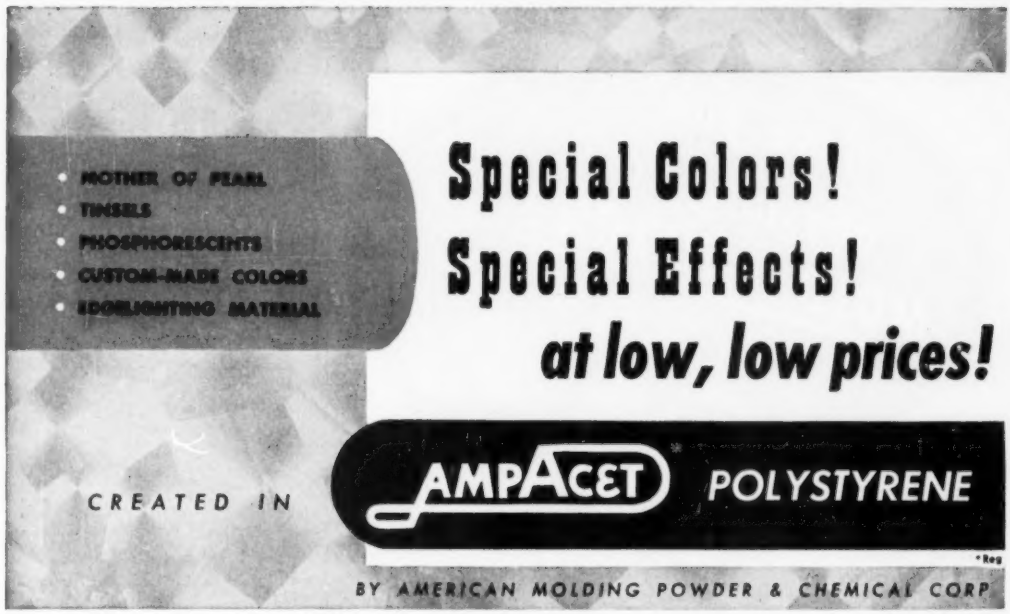

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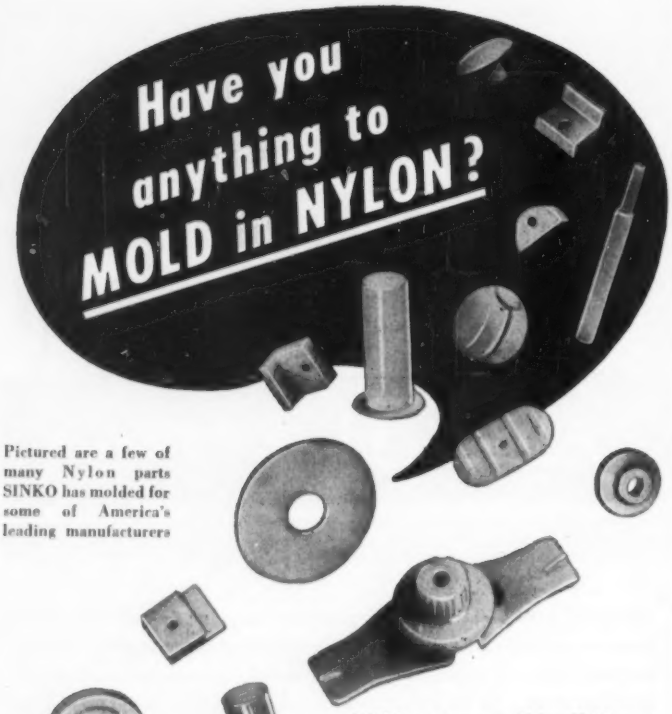

Pictured are a few of many Nylon parts SINKO has molded for some of America's leading manufacturers

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foamy crust, yet which burns when its edge is ignited. 4) Material which is self-extinguishing but burns part way. 5) Vinyl sheet which takes fire only from intense heat but burns voluminously once ablaze. 6) Sheeting which will not support combustion once the source of heat is removed.

The test equipment used for all flame resistance tests on vinyl sheeting is shown in Fig. 15. Specimens, after being air-dried for 3 hr. at 80° C., are mounted in a holder (held here in the operator's right hand) and inserted in the tester. The position of the sample in the holder and the assembly's position relative to the flame in the tester vary according to which of the six tests is being run.

GROUP IV

Plasticizers and stabilizers used in the processing of plastics vary in their sensitivity to heat. Some dry out more readily than others, causing the fabric to stiffen. Colors, too, vary in their *sensitivity to light and heat.*

When plastic fabrics are exposed for prolonged periods to elevated temperatures and direct sunlight, these variables can seriously affect the performance of the materials. For such end uses, stability to heat and light tests serves as a check upon purchases of plastic materials suitable to such extremes.

A fadometer, such as shown in Fig. 16, or any unit which will give comparable results, is used to test heat and light stability. The shield around the base of the illustrated test machine has been removed to show the position in which samples of pyroxylin- and vinyl-coated fabric and vinyl sheeting are exposed to the radiation from a glass-enclosed carbon arc lamp at a sustained temperature of 190° F., ±5°, for a specified number of hours. With coated materials, it is the coated side that is exposed. Upon removal from the test unit, the specimens are examined for stiffness and discoloration.

Fastness to Crocking

Crocking is a condition where the color in a plastic material comes off when rubbed. A test of the fastness of the basic color in pyroxylin- and vinyl-coated fabrics and vinyl

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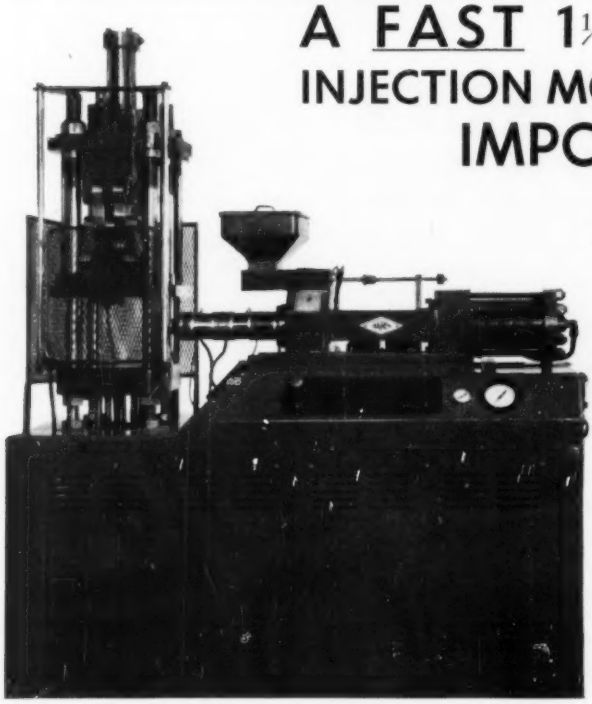

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SPECIFICATIONS:

Injection Capacity—1½ to 3 Ounces
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21,200 lbs. p.s.i. (1½ Ounces)
16,000 lbs. p.s.i. (2 Ounces)
6,530 lbs. p.s.i. (3 Ounces)
Clamping Pressure (Fast Action) 50 Tons
Clamping Stroke—6 Inches
Auxiliary Compression Cylinder—5 Tons
Compression Stroke—4"
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Machine to Cycle (Dry Run)—10/minute
Dimensions—76" long—32" wide—95" high

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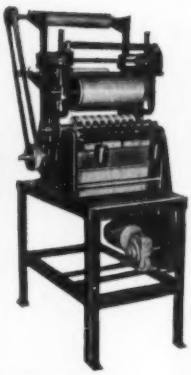

• Because it can be quickly switched from aniline to surface to rotogravure printing merely by changing rolls, the Liberty "Versatile" Press finds great favor with printers of vinyl films, coated fabrics, laminations and other plastic web materials.

It's a precision engineered unit, sturdily built for production runs, yet flexible enough for laboratory work. Wash-down and color changes can be made without removing the roll. Take-up and let-off are optional. Write for details. LIBERTY MACHINE CO., INC., 275 Fourth Avenue, Paterson 4, New Jersey.

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are listed in the Manufacturer's Literature Page of this issue.

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There are forty-four items listed this month—something to interest everyone. The Manufacturer's Literature Page is found on pages 197, 198. Turn to it now.

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sheeting is a service test since the condition is likely to appear only through hard, sustained wear.

Certain colors show a greater tendency to rub off than do others and, when such pigments are used, it is not uncommon to cover the top surface of the plastic fabric with a clear coating. Such a clear coating may also be used on printed plastic materials.

In the test for fastness to rubbing, a specimen is rubbed against bleached, but not starched, white cotton print cloth that is held firmly over the flat end of a cylindrical finger (Fig. 17). This finger, pressing with a force of 32 oz. upon the coated fabric or sheeting, moves back and forth in a 4 in. long stroke 20 times at a rate of a double stroke every second. The test is made with the specimen and white cloth dry and with the cloth dampened sufficiently so the moisture content is between 75 and 100% of the original weight of the cloth.

GROUP V

Blocking in vinyl-coated fabrics and vinyl sheeting may be best described as a surface tackiness. Such a condition, attributable to the use of certain types of plasticizers or low molecular weight resin, can cause trouble both in storage and in service.

Tests for blocking involve placing samples of coated fabric or sheeting face to face between glass plates, and heating.

Coated samples to be tested, weighted with a 1-lb. weight (Fig. 18) are heated for 30 min. at a specified temperature in a thermostatically controlled oven, then allowed to cool for at least 15 min. before being separated.

As they are separated, the vinyl sheet specimens are rated as to whether 1) the sheets are free and there is no blocking; 2) the sheets adhere slightly, which is also classified as "no blocking"; 3) the sheets must be peeled to separate, termed "slight blocking"; and 4) the sheets cannot be separated intact, classified as "blocking."

Volatility

Volatility in vinyl-coated fabrics and vinyl sheeting relates to the degree to which plasticizers tend to escape from the materials in the

form of a gas, leaving the fabrics dry and stiff.

Laboratory tests, conducted under extreme conditions, provide a basis for comparison of variously formulated plastics and can quickly pinpoint extremes of volatility. Figure 19 shows the circulating hot air oven in which specimens are held for 5 hr. at 220° F., ±2°.

The first step in determining degree of volatility is the weighing of the sample.

After oven treatment is ended, this specimen is cooled and again weighed. The loss of weight is then computed; it must not exceed a specified amount if it is to pass the test successfully.

GROUP VI

If too much castor oil is used in formulating a pyroxylin coating, the excess oil exudes to the surface. Such a condition can be bad, particularly when the material is used for seat covers.

Figure 20 shows steps in a *spue test*. Small samples are placed face up on a cork mat, covered with cigarette papers and weighted with metal disks providing a pressure of 1 oz. per sq. in. (specimens at right in Fig. 20).

The cork mat, the specimens, cigarette papers, and weights are heated in an oven at a temperature of 150° F., ±20°, for 30 minutes. At the conclusion of the test, the cigarette paper should be free of oil stain.

Further Details

Members of the Plastic Coatings and Film Association who collaborated in preparing this article are: Athol Manufacturing Co.; Bolta Products Sales, Inc.; E. I. du Pont de Nemours & Co., Inc.; The Federal Leather Co.; Firestone Plastics Co.; Goodall-Sanford, Inc.; The B. F. Goodrich Co.; Joanna Western Mills Co.; The Landers Corp.; The Masland Duraleather Co.; The Pantasote Co.; Respro, Inc.; Textileather Corp.; and United States Rubber Co.

More detailed test specifications and directions are contained in the booklet "Standard Test Methods for Pyroxylin and Vinyl Resin Coated Fabrics and All-Plastic Sheeting" obtainable from any of the above companies.—END

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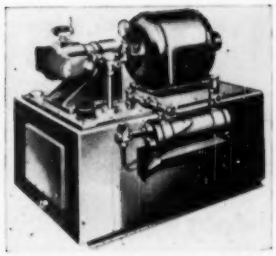
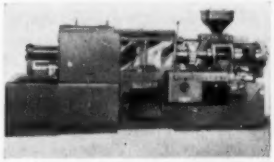
The regularity with which Marvel Synclinal Filters are selected by DESIGNERS—PRODUCTION MEN—MAINTENANCE MEN is an important consideration for you when selecting a FILTER for your machinery. It tells better than a thousand words why you can rely on MARVEL Synclinal Filters for dependable protection of liquids in all HYDRAULIC and LOW PRESSURE SYSTEM.

It's sound business to protect the investment your machinery represents. Why not ask Marvel how you can enjoy the protection of Marvel Synclinal Filters—no cost or obligation to get the facts.



Large series hydraulic pumping unit manufactured by The Denison Engineering Co., are equipped with Marvel Synclinal Filters.

Model A-12 Hufford Stretch-Wrap Forming Machine manufactured by Hufford. Marvel Synclinal Filters are installed as standard equipment.



Reed-Prentice injection molding machine used at Superior Plastics, division of Commonwealth Plastics, Inc., are equipped with Marvel Synclinal Filters.

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Line Type (Cutaway)

Marvel Synclinal Filters are winning new laurels for performance with an ever-widening number of users. OVER 300 ORIGINAL EQUIPMENT MANUFACTURERS specify Marvel Synclinal Filters for protection to coolant and lubricating systems. Fine and large foreign particles which have an abrasive action on bearings or impair flow orifices are filtered out with Marvel Synclinal Filters.

Available in sump and line models, in capacities of 5 to 100 G.P.M., and in wire mesh sizes from 30 to 200. Multiple installations provide capacities as great as you may require. Both models are easy to disassemble, clean and reassemble. Line types operate in any position and may be serviced without disturbing pipe connections.

WATER FILTERS—both our sump and line type models have been adapted for use in all water filtering applications. No changes have been made in the basic Synclinal design.

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Industry Eyes Styrene Expansion

INTEREST in styrene and polystyrene is running at a high pitch these days. The chief reason could be the supposedly impending sale of the Government's rubber plants to private industry and the impact such a move would have on the styrene monomer industry.

Meanwhile, styrene resin molding powder production has been rolling along for the first six months at a 60% increase over the same period in 1952, and speculation is rife as to just what that figure means.

In the first six months of 1952, sales were between 15 and 18 million lb. a month. In 1953, they have been fluctuating between 22 and 29.5 million lb. for the first six months, which is a rate that will average almost as much as the last six months of 1952, although in that late 1952 period there was one month when 33 million lb. were sold.

Conservative estimates place the total amount of styrene molding material to be sold in 1953 at between 300 and 325 million lbs., in comparison to 249 million lb. in 1952, or a 20 to 30% increase. Thus, like most other business men today, styrene molding material producers are not generally inclined to believe that the second half of this year will show the phenomenal growth of the second half of 1952. If it does, they are in better shape to take care of increased demands, but at this writing there is nothing on the horizon to indicate that the last six months' consumption will average much more than 30 million lb. a month and there is some doubt that it will go that high.

Impact Material Volume — It is believed that impact styrene molding powder will account for about 100 million lb. of the 1953 production. By 1955, the impact material may reach 60% of the total.

There are six principal outlets for styrene molding material. It is difficult to divide up the poundage used by each, for there is considerable overlapping; that is, one company may put appliances, including television and refrigeration all together, while another may make separate estimates for each. Allowing for these alterations and with the realization that this must be a rough guess, here is how the situation in these six outlets looks for 1953, in millions of pounds, based on an estimated 300-million lb. year:

Housewares	50 to 65
Refrigeration, including air conditioning	40 to 50
Toys	45 to 55
Wall tile	35 to 40
Packaging	30 to 35
Radio and television	20 to 25

The remainder would be for unidentified industrial uses, such as clock housings and other appliance or miscellaneous parts; novelties; polystyrene coatings; and phonograph records. Styrene for the latter is growing steadily — has eaten into the volume of all other resins, including long-play and shellac-type popular records, but is still estimated to be under 10 million pounds.

The refrigeration figure given above includes a growing number of air conditioning louvers and metal supported housings. The refrigerator parts are breaker strips, drawer pans, drip pans which go under the freezing unit, door fronts, and crispers, with volume divided in that order. Molded styrene door panels for refrigerators are still in their infancy.

Large molded pieces, such as medicine chests, furniture parts, housings for business machines, and the like have not yet made much headway but are still possibilities for volume use, especially when industry becomes more familiar with impact styrene.

Expanded Facilities — Total production capacity for styrene molding material is changing rapidly since various firms are bringing in new or expanded facilities, but the industry operated at an annual rate of over 380 million lb. last March, and today's capacity is probably over 400 million.

In addition to the expanding facilities of the four major producers who have not yet reached their peak, several newcomers are now, or soon will be, in the field. The Catalin polymerization plant in Calumet City, Ind., is now about ready with a capacity of at least 12 million lb. a year, but will eventually go to 20 million. Foster-Grant Co., Inc., Leominster, Mass., is already polymerizing monomer at Leominster for sale by Muehlstein under the name of Fosterene. Its monomer plant in Baton Rouge, La., is about a year away; when completed, the monomer will be used for stepped-up polymerization capacity at Leominster where estimated capacity will be 20 million lb. or more annually.

Pathfinder Chemical Co., a member of The Goodyear Tire & Rubber Co. family, obtained Certificates of Necessity for styrene products but has made no move to start building as yet. Pennsylvania Industrial Chemical Corp., Clairton, Pa. (Piccolite), has a monomer plant about half finished with perhaps a 100,000-lb. daily capacity, but will produce no hard resins. Its capacity will be captive and used for "soft" styrene resins or the type generally used with butadiene for copolymer purposes.

A Certificate of Necessity has also just been granted to American Cyanamid for a monomethylstyrene plant in Avondale, La. This material is of the same order as vinyl toluene, requires no benzene, and can generally be used interchangeably with styrene. The company has made no comment as to its plans for production.

Monomer Use Figures — In 1953, the amount of styrene monomer used for molding material should be somewhat over 300 million pounds. The amount of monomer used for synthetic rubber would be 350 million lb. if the industry operates at the same rate it did in the first four months of 1953. Monomer production was at a rate of 900 million lb. in March 1953, and more facilities are coming in; but it is doubtful that any such rate will be maintained

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THE PLASTISCOPE

during the year because it is unlikely that other outlets for monomer will require the theoretical 250 million lb. left after molding material and rubber are provided for in 1953.

The possibilities for 1954 are quite different, for there will be more monomer and probably large increases for styrene-butadiene latex, as well as other styrene products.

Steel Company in Plastics Pipe

PURCHASE of Owings-Sharpe, Inc., Magnolia, Ark., a plastics pipe and tubing company, has been announced by Republic Steel Corp., Cleveland, Ohio. The step marks the first entrance of the steel company into this field. C. M. White, president of Republic, stated that his organization entered the plastics field because plastics pipe and tubing have a very definite place in today's industrial picture.

Jay W. Owings was named manager of sales of Republic's pipe division and Norman W. Foy was elected sales vice president. Mr. Owings spent a quarter of a century in the pipe business. A graduate of Case Institute of Technology, he held important positions at the American Gas Association testing laboratories and Youngstown Sheet and Tube Co. During the war years, he was deputy chief of the pipe section of the Iron & Steel Div., War Production Board. In November 1952, in association with Leslie P. Sharpe, he organized Owings-Sharpe, Inc.

Vinyl Motion Picture Screens

ANNOUNCEMENT of the manufacture of theater-size vinyl motion picture screens has been made by Plastic Creators, Inc., Industrial Ave., Little Ferry, N.J.

The recently established company has purchased a modern plant at Little Ferry, where three-dimensional and standard motion picture screens will be manufactured for the Radio Corp. of America.

In addition, the facilities of the plant, furnished with modern electronic equipment by Mayflower Electronic Devices Corp., will be available for fabrication of plastics products ranging from large plastics tarpaulins, such as those used to cover baseball infields and tennis courts, to smaller products and packages.

B. L. Smith, president, was formerly associated with Du Pont and Olin Industries.

Light Weight Glass Cloth

PRODUCTION of fibrous glass cloth which measures 0.001 in. in thickness and weighs 0.81 oz. per sq. yd. from smaller diameter fibrous glass yarn than ever before produced, has been announced by Soule Mill, New Bedford, Mass. The principal application of this cloth with plastics resins will be in the electrical apparatus industry where, as the carrying medium for mica and insulating varnishes, it will permit design engineers to further reduce space factor requirements.

Twenty yards of this fabric, 36 in. wide, are woven from one pound of glass yarn. This new fabric represents a reduction of 33⅓% from 0.0015-in. glass cloth, the thinnest made until now.

More Uses for Fluorocarbons

GROWTH of the market for products made from Kel-F was visually illustrated recently in a display set up by The M. W. Kellogg Co. In addition to already well-known Kel-F products, such as insulators, diaphragms, coil forms, coated wire, non-stick coatings for rollers, carbon resistor covers, and transformer terminal plugs, several comparatively new applications were on display.

Low density porous filters, made by Pall Filtration, in thicknesses from 1/16 to ⅛ in. and diameters up to 15 in. were shown. These Kel-F filters are resistant to nearly all chemicals and their porosity permits the blowing of corrosive gases into corrosive acids through a filter without frequent replacement of corroded filters.

Film made from a dispersion coating of Kel-F is claimed to be superior to extruded film. The film, furnished in various colors, is produced by casting layer on layer and baking each layer half an hour or so. Thicknesses as great as 12 or 15 mils may be achieved. It Is claimed that the casting method permits use of high molecular weight material, thus increasing toughness and giving better performance at extremely low temperatures.

An ink especially developed for printing on Kel-F is particularly helpful in producing Kel-F coated wire because the coating can now be printed with multiple stripes for identification purposes. Heretofore, it has been necessary to extrude the coating in solid color, which necessitated cleaning out the extruder chamber after each color has been run.

A Kel-F expansion bellows for a naval tanker's oil feed line, that can be hooked into the line, obviates the need for those big "U"-shaped joints on oil pipes, which have always been necessary to take care of expansion in the line caused by changes in temperature.

Injection molded Kel-F inserts for locking nuts are valuable when high heat resistance is needed.

Blown bottles from Kel-F dispersions have high heat and chemical resistance.

Properties of Molykote, a graphite-like lubricating material, are upgraded by adding a 10 to 15% portion of Kel-F.

A new dispersion coating of Kel-F on metal fuses at 480 to 500° F. after 30 min. of exposure. An air-drying operation may eventually become possible for this application.

M.C.A. Research Project

DESIGN and construction of special testing equipment to determine how plastics behave under stresses, varying temperatures, and aging is described in a recent booklet published by the Massachusetts Institute of Technology and members of the Manufacturing Chemists' Association. This report is a result of the work done by the research group on design and testing that was set up at M.I.T. in 1945 by 18 plastics manufacturers.

The booklet reports that the Universal Plastic Testing machine developed on the project has served as the model for many commercial units. Another piece of equipment,

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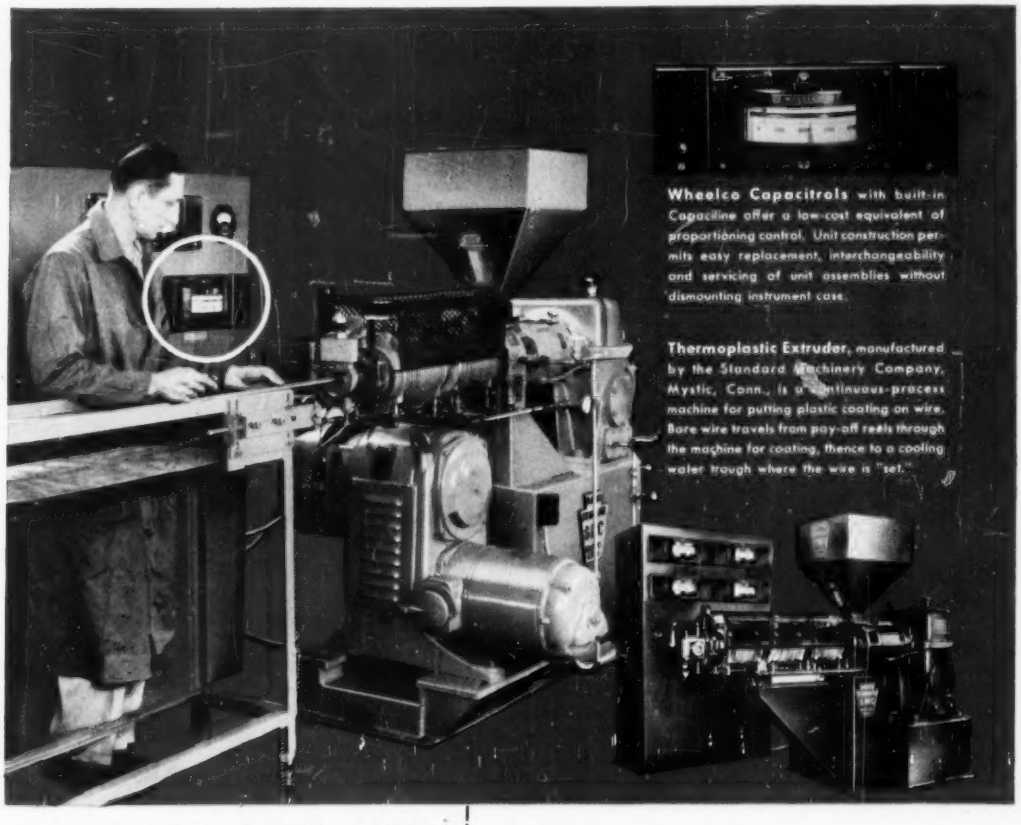
Wheelco Instruments

...control heat precisely when DAVIS-STANDARD puts plastic coating on wire

This is the Davis-Standard Thermoplastic Extruder—a high production machine used by many of the nation's leading manufacturers of rubber and insulated wire.

Wheelco Panelmount Capacitrols . . . standard equipment on this machine . . . give positive stock screw temperature control required for thermoplastic insulating at fast, uniform rates. Their *electronic control principle* provides a no-contact system that is constantly vigilant to slightest temperature changes, instantly fast in controlling electric heating load. There's no time lag . . . no over- or undershooting of control temperature.

Use Wheelco Capacitrol Instruments for indicating and controlling all temperature ranges in plastic within closest limits.



Wheelco Capacitrols with built-in Capaciline offer a low-cost equivalent of proportioning control. Unit construction permits easy replacement, interchangeability and servicing of unit assemblies without dismounting instrument case.

Thermoplastic Extruder, manufactured by the Standard Machinery Company, Mystic, Conn., is a continuous-process machine for putting plastic coating on wire. Bare wire travels from pay-off reels through the machine for coating, thence to a cooling water trough where the wire is "set."

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a wheel-type extensometer, makes possible the measurement of true strain for the first time. The booklet also mentions a novel testing technique to measure performance of thermosetting plastics under high temperature and pressure molding.

An indirect benefit of the basic research program has been the training of a substantial number of graduate students in the engineering properties of plastics and laminated materials, most of whom are now active in the industry.

New Vinyl Acetate Plant

SIX months ahead of schedule, the Chemical Div. of Celanese Corp. of America has started shipment of vinyl acetate from its new plant in Pampa, Texas. The plant is capable of producing in excess of 30 million lb. annually, according to Manager John Frick. Celanese thus becomes the second major supplier of vinyl acetate monomer.

The monomer will be produced by a new method which does not call for the use of the customary acetylene.

Imported Polyethylene

ARRIVAL of a 2-million lb. shipment of polyethylene from overseas has been announced by Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio, for use in producing polyethylene pipe. Carlon asserts that it was impossible to obtain sufficient material from domestic suppliers to meet ever-increasing demands for polyethylene pipe.

In addition to its main plant in Cleveland, Carlon now maintains plants in Sandusky, Ohio; Ashville, N. C.; Klamath Falls, Ore.; Denver, Colo.; and Corsicana, Texas.

Polyethylene Film for Printing

DEVELOPMENT of polyethylene film, marketed under the name of Polytreat, which has been positively treated for printing, has been announced by Extruders, Inc., Hawthorne, Calif.

The company began extruding polyethylene film in 1949 and in 1951 became affiliated with Pioneer Rubber Mills, San Francisco. That same year, Extruders moved into its 45,000-sq. ft. plant in Hawthorne and has concentrated ever since on a polyethylene film which could be printed upon with little difficulty.

Antistatic Stabilizer

STABILIZING agents for vinyl films that have antistatic properties as well as light stabilization have been developed by Alframine Corp., 4731-4661 E. 52nd Dr., Los Angeles 22, Calif. If used up to 2% by weight of the vinyl resin, Duranyls act only as stabilizers and prevent discoloration during the molding and aging process or exposure to sunlight. If used at 4 to 5%, Duranyls not only stabilize but also destaticize vinyl resins permanently. In addition to these two important properties, the compounds have many other advantages. They are nontoxic, non-inflammable, and allow the application of inexpensive alkylated aromatics as plasticizers without any bleeding. During the molding process, the Duranyls deodorize these aromatics.

Duranyls are especially recommended in the manufacture of phonograph records, foam plastics, tiles, floor covering, spread coatings, textile coatings, garden hose, etc.

High Vacuum Equipment

ACQUISITION of approximately 25% of the outstanding stock of Leybold-Hochvakuum-Anlagen G.M.B.H., Cologne, Germany, has been announced by National Research Corp., 70 Memorial Dr., Cambridge, Mass. The parent company is E. Leybold's Nachfolger, pioneer European producer of high vacuum apparatus and equipment.

Activities of the German company are concerned with industrial applications of high vacuum technology in such fields as impregnation, distillation, dehydration, coating, and vacuum metallurgy.

License arrangements have also been completed whereby the Equipment Div. of National Research Corp. has exclusive United States manufacturing rights for equipment developed by Leybold-Hochvakuum. Under a previous arrangement, National Research had already acquired exclusive North American distribution of the German company's vacuum pumps, which it is claimed can perform with undiminishing efficiency even in the presence of water vapor.

Casein

CESSATION of production and sale of acid and rennet casein has been announced by Hercules Powder Co., Wilmington, Del. The company reports that its major interest in casein had always been that of a producer and that domestic milk prices have made it economically impossible to manufacture it at costs which allow it to be sold in competition with imported casein.

Hercules' casein plants in Elroy, Wis., and in Cambridge and Watertown, Minn., have been closed.

Adhesive in Squeeze Bottles

ADHESIVES seem to be the next products that will come to market in polyethylene squeeze bottles.

The feat of preparing an adhesive which can be applied from a squeeze bottle is considered quite a triumph in the packaging industry since adhesives have a notorious tendency to dry up, crack, and become useless after exposure to air.

Slomons Laboratories, Inc., 31-27 Thomson Ave., Long Island City 1, N.Y., claims to be the first manufacturer of adhesives to market its product, called Sobo, in a squeezable bottle.

New Stabilizers

TWO new stabilizers—C-77 and CH-20—have been developed by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N.Y.

Stabilizer C-77 is a complex organic cadmium compound which does not contain fatty acids. It is recommended for 2 to 4% dosage, based on resin content. Outside weathering tests and 1000-hr. Fadeometer tests indicate that C-77 has outstanding heat and light stabilization properties with ester type plasticizers. The company claims that it is an improvement over conventional barium-cadmium laurate-type stabilizers because it gives exceptional stabilization in compounds that contain heat-sensitive organic

Dog leash and collar and handle grips by Hungerford Plastics Corp., Rockaway, N.J.

Maid of Marvinol ... smart and practical!

Easy to see why! These Marvinol® vinyl products—injection molded by Hungerford, a pioneer and leader in the field of injection molded vinyls—provide *new eye appeal, serviceability,* and *economy.*

Made of new Marvinol VR-21, they're...

- *brilliantly, lastingly colored*
- *completely non-staining to hands and clothing*
- *impervious to water, perspiration, oil, gasoline, most chemicals*
- *flexible at below zero temperatures*
- *sun and weather resistant*
- *resistant to chipping, cracking, and abrasion*
- *always pleasant to the touch*

And Marvinol VR-21 makes them economical to produce. A straight polyvinyl chloride resin, VR-21 processes as easily as a copolymer resin. It gives dry, fluffy premixes without the use of heat, and has excellent tolerance for plasticizers. In fact, VR-21 is so easy to process, it makes these injection molded items competitive.

Whether you calender, extrude, mold, or laminate, "Made of Marvinol" might well be the customer-pleasing, profit-making advantage your product needs. Why not discuss it with a Naugatuck technical sales representative?

For more about this partner to Naugatuck's VIBRIN® polyesters and KRALASTIC® rubber-resin blends, write on your letterhead to the address below.

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pigments, especially the red types. The stabilizer is also very effective in compounds where high percentages of phosphate plasticizers are used.

Stabilizer CH-20 is non-metallic and is used in combination with metallic stabilizers. Its main function in stabilizing systems is to prevent initial yellowing on prolonged processing at elevated temperatures. CH-20 can be added whenever yellowing starts to appear during processing. It is even reported that CH-20 will prevent spewing or sweating out, which is normally encountered with some plasticizer systems.

COMPANY NOTES

Bakelite Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y., has announced the promotion of **C. W. Blount** as vice president in charge of sales and **H. K. Intemann** as vice president and general sales manager. Mr. Blount succeeds **George C. Miller**, recently named president of Bakelite as successor to **H. S. Bunn** who became vice president of Union Carbide, following the recent death of J. W. McLaughlin. Mr. Blount joined Bakelite in 1924 and has long been particularly noted for his faith in the phenolic industry.

C. W. Blount

H. K. Intemann

Mr. Intemann, who moved up from his former position as assistant general sales manager, is especially well known in the vinyl and polyethylene field where he has been prominently identified ever since these resins became available on a commercial scale. Mr. Intemann joined the company in 1930, following his graduation from Stevens Institute of Technology. He has been succeeded by **John D. Benedito**, formerly manager of the Molding and Extrusion Materials Dept. Mr. Benedito joined Union Carbide in 1935.

Witco Chemical Co. has recently completed a 25,000-sq. ft. warehouse at its Chicago plant, 6200 W. 51st St., to replace the one which burned down last year. The offices at the plant have been consolidated into one building.

Standard Mfg. Co., designer and fabricator of Plexiglas signs, has started production in its new plant at 1100 S. Central Park, Chicago, Ill. The move provides the company with 20,000 sq. ft. of floor space, three times the area formerly occupied at N. Lincoln Ave.

Plastics Div., Celanese Corp. of America, Summit, N. J., announces the following appointments: **Dr. William L. Evers** has been named assistant manager in charge of the division's research at the laboratory. He was formerly affiliated with Rayonier Corp. and Rohm & Haas Co. **Dr. Walter D. Paist** now heads the newly formed applications research section; **Dr. Richard E. Davies**, the polymer research section; and **Lawrence Lynn**, the process engineering section.

Canadian Resins and Chemicals Ltd., 600 Dorchester St., W., Montreal, Canada, has appointed **George M. Hale** as assistant manager of industrial products and **Maurice F. Malone** as a sales representative for the division in the Toronto district office.

Bjorksten Research Laboratories, Inc., Madison, Wis., announces that **Dr. Lawrence Zeldin** and **Robert L. Goller** have joined the organization. Mr. Goller was formerly connected with Du Pont's Chemical Div. and Pittsburgh Plate Glass Co.

Dillon-Beck Mfg. Co., 1227 Central Ave., Hillside, N. J., announces the following new officers: **J. Park Logan**, president; **Charles B. Sanders**, vice president of sales; **Richard R. Lowe**, vice president of manufacturing; **William E. Selby, Jr.**, secretary-treasurer.

Textileather Corp., 607 Madison Ave., Toledo 4, Ohio, announces that shipments for the first four months of 1953 increased 22% over the same period of last year.

The NuBone Co., Inc., Erie, Pa., manufacturer and distributor in the apparel and textile field since 1908, has put into operation a new plastics division for injection, compression, transfer, and fibrous glass molding. The company will do custom and proprietary molding and has placed on the market a line of fibrous glass street signs and highway markers. The division will be supervised by **J. H. Brecker.**

Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y., announces that **Dr. Walter H. Prahl** has been elected a vice president and **Max G. Rein** appointed traffic manager. Dr. Prahl is inventor of the Raschig process for the synthesis of phenol from benzene. Rights to the process were acquired by Durez in 1937, and Dr. Prahl designed and supervised the construction and operation of the company's phenol plant.

Fuchs Bros., producers of Sani-Plex products, is now located at 12 W. 27th St., New York 1, N. Y.

Square D Co., Peru, Ind., announces the appointment of **T. E. Adams** as sales manager of the Molded Insulation Div. in Peru. **H. S. Freeman**, former sales manager of the division, has assumed new duties as consultant to the executive vice president, **L. W. Mercer**, and is still located at the company's Detroit, Mich., plant.

Witco Chemical Co., 260 Madison Ave., New York 16, N. Y., announces the appointment of **Charles W. Grubb** as sales manager, with offices at 141 Milk St., Boston 9, Mass., to cover the New England states. **Harry M. Brubaker** has been promoted to sales manager of the company's Carbon Black Div., 311 Evans Bldg., Akron, Ohio.

Braun-Hobar Corp., Milwaukee, Wis., manufacturer of molded caps and other packaging specialties, has purchased **Kampa Mfg. Co.** Braun-Hobar headquarters will be located

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In step with our pioneering of organo-metallic stabilizers, and especially of our patented organo-tin stabilizers for premium vinyl compounding, Advance is offering, after extensive research, a new concept in vinyl stabilization—

STABILIZER C-77

Especially designed to overcome the common faults of laurate stabilizers, our new STABILIZER C-77 has these all-around, superior characteristics:

- Outstanding for heat and light stabilization. Overcomes plating difficulties, printing and adhesion troubles common with metallic lauric type stabilizers.
- Stabilizes sensitive organic pigments, especially reds, when used with our CH-20
- Prevents spewing and oxidation of most secondary plasticizers.

For a new stabilizer system, let us send you data and samples of STABILIZERS C-77 and CH-20

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Partial List of Advance Vinyl Stabilizers

Stabilizer 52 (liquid) Stabilizer OM-10 (liquid) (patented organo-tin compounds)	Outstanding heat and light stabilizers. Cannot be duplicated for transparency and glass-like clarity. Unsurpassed for outdoor weathering.
Stabilizer 17-M (liquid) (organo-tin sulfur compound —patents applied for)	Most powerful of organic stabilizers. Especially effective for rigids as well as for clear films and plastisols.
Stabilizer BC-12 (a co-precipitated barium-cadmium laurate)	Our most popular stabilizer, used effectively alone or in combination with our epoxy or chelating stabilizers for low cost clears or pigmented stocks.
Stabilizer CH-14 Stabilizer CH-20	Valuable anti-oxidants, used with BC-12 or C-77, or other metallic stabilizers. CH-20 especially recommended when phosphate plasticizers are present.
Stabilizer E6B	Polymeric epoxy type. Extremely useful with lead and other stabilizers. Outstanding for all chlorine containing polymers.
Stabilizer 89-X	A new development for low cost clears.

For plastisols, we have some new recommendations for general performance, as well as for non-staining. Ask for details.

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at the former Kampa plant, 12132 W. Capitol Dr., Milwaukee, upon completion of a new 12,000 sq. ft. addition. Eight compression presses and seven injection machines will be put into operation when the move is made.

Freezer Queen Products Co., manufacturer of polyethylene packaging, has moved to larger quarters at 210 S. Clinton St., Chicago, Ill. The larger space accommodates new machinery which produces barrel and drum liners up to 55-gal. size and printed and perforated bags for produce, poultry, and commercial packaging.

Hercules Powder Co., Wilmington, Del., has named **Bruce Oakley** as New England technical representative for molding powders. Mr. Oakley replaces **John G. Fuller, Jr.**, who has assumed new duties at Hercules Experiment Station at Wilmington.

Blaw-Knox Co.'s Chemical Plants Div., 2023 Farmers Bank Bldg., Pittsburgh, Pa., announces the appointment of **Charles F. Hauck** as sales manager and **Bruce Alexander** as assistant sales manager.

Auto-Vac Co., 2120 Post Rd., Fairfield, Conn., has appointed **Dewey Rainville**, Rainville Co., 53 Hilton Ave., Garden City, N. Y., as its sales representative in the metropolitan New York area.

Continental Can Co., Inc., has purchased the flexible packaging business of **Shellmar Products Corp.**, Mt. Vernon, Ohio. Shellmar's Flexible Div. is a converter of cellophane, polyethylene, Pliofilm, acetate, foil, and various laminated and coated products, with plants at Mt. Vernon and Zanesville, Ohio, South Gate, Calif., and Columbus, Ga. The division also has five operating companies in Latin America, as well as affiliates in other foreign countries. It is contemplated that the Shellmar name will be acquired by Continental.

Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa., has made the following transfers of sales representatives: **Dr. J. W. Richardson**, from Kansas City, Mo., to Los Angeles, Calif.; **Carl W. Bontemps**, from Dallas, Texas, to Kansas City, Mo.; **Ernest F. Dourlet**, from Chicago, Ill., to Dallas, Texas; **Kenneth G. LeFevre**, from Philadelphia, Pa., to Chicago, Ill.

Sam Chinkes & Associates, industrial designers, are now located at 72 E. 167th St., New York 52, N. Y.

Lucidol Div., Novadel-Agene Corp., 1740 Military Rd., Buffalo 5, N. Y., is in the process of installing new and larger equipment for the production of t-butyl hydroperoxide and alkyl peresters.

Acheson Dispersed Pigments Co., 2250 E. Ontario St., Philadelphia 34, Pa., is the new name of Peerless Printing Ink Co. The operation will continue as a unit of **Acheson Industries, Inc.** A Peerless Printing Ink Dept. of the newly named company will continue to manufacture colored newspaper supplement inks. Plastics inks will be produced under the new name.

Celanese Corp. of America's Chemical Div. has established a new sales office at 1422 Euclid Ave., Cleveland, Ohio, under the direction of **Richard A. Schwab**, formerly sales district manager of the Detroit office, which has been closed.

The division also announces the appointment of **William B. Sinclair** as New England sales representative, with headquarters at 140 Federal St., Boston, Mass. Mr. Sinclair was formerly associated with Westvaco Chemical Div., Food Machinery & Chemical Corp.

American Cyanamid Co.'s Plastics & Resins Div. was presented with an honorable mention award in the 1953 Creative Competition of the National Advertising Agency Network for its campaign of integrated advertising and merchandising which appeared in the pages of MODERN PLASTICS.

Carborundum Co.'s Abrasive Sales Div., Niagara Falls, N. Y., has made the following appointments: **George H. Dennison** has been named Buffalo district sales manager; **William G. Kettner, Jr.**, manager for the New York sales district; **C. R. Strong** was transferred to the Peoria, Ill., territory; **F. H. Garske, Jr.**, **A. G. Ott**, and **J. H. Spehr** will service the Wisconsin territory formerly handled by Mr. Strong.

The Dow Chemical Co., Midland, Mich., reports that **Thomas M. Gow** has been appointed supervisor of plastics sales for the Cleveland area. **M. H. P. Morand**, of the Chicago office, succeeds Mr. Gow as assistant to the head of the coating sales section at Midland.

Hercules Powder Co., Wilmington 99, Del., has announced that **Anson B. Nixon**, a vice president of the company since 1940, has been elected chairman of the board, succeeding Charles A. Higgins who recently retired. Mr. Nixon resigned as a company vice president to accept the post. **Albert E. Forster**, president of Hercules, was elected a member of the company's finance committee. **Montgomery R. Budd** has been named director of advertising to succeed Theodore Marvin, who after 30 years with the company, resigned to become president of Michigan Chemical Corp., St. Louis, Mo. Mr. Budd joined Hercules in 1929 as associate editor of *The Explosives Engineer*.

Maryland Plastics, Inc., Federalsburg, Md., announces the appointment of the following representatives for its Industrial Custom Molding Div.: **Walter V. Williams**, 33-02 Broadway, Long Island City, N. Y., to handle New York and Connecticut; **Wagner Engineering Co.**, 33rd & Arch Sts., Philadelphia 4, Pa., for Pennsylvania, Delaware, Maryland, Washington, D. C., and southern New Jersey; **Carl A. Karthauser & Co.**, 1502 Union Bank Bldg., Pittsburgh, Pa., for western Pennsylvania; **Henderson Sales Co.**, 8131 Manchester Ave., St. Louis 17, Mo., to serve Missouri, Iowa, Kansas, and southern Illinois; **Thomas Nelles**, 520 Madison Ave., Toledo, Ohio, for Ohio; and **Robert L. Binkelman**, 312 Stephenson Bldg., Detroit, Mich., for Detroit. **J. M. Waldecker**, 401 N. Broad St., Philadelphia 8, Pa., is director of the company's Industrial Sales Department.

Bolta Product Sales, Inc., Lawrence, Mass., has named **Western Asbestos Supply Co., Div. of Western**

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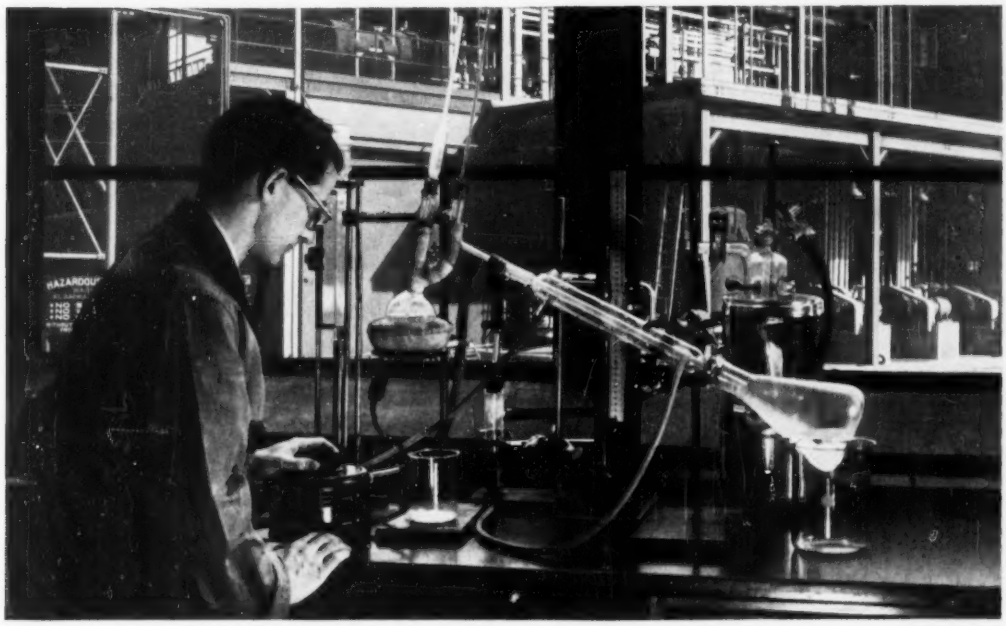

There is more in a bag of Dow PVC than polyvinyl chloride resin. The "extra" we are making reference to is Dow's research and experience in the development and manufacture of plastics materials. Dow has a long history of assistance to buyers of plastics in the application of plastics materials to many methods of fabrication. For the Dow PVC customer these assets are available through Dow's technical service department.

As a major producer of vinyl chloride monomer over a number of years, Dow's experience, plus new PVC production facilities devoted exclusively to the production of resin, give the company an outstanding supplier status. The vinyl industry is assured a dependable source of quality resin.

Contact Dow Sales Offices for full information regarding the advantages of utilizing Dow as a regular, reliable source of PVC. Find out how Dow Plastics Technical Service and aggressive research programs can help you. For more information on Dow PVC write THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Department, PL 1481.

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Asbestos Co., 148 Townsend St., San Francisco, Calif., as distributor of Bolta-Wall and Bolta Wall-Tile in the northern California and western Nevada areas.

Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y., has announced the development of a new adhesive called Vinyl-Grip, especially designed for adhering saran and mohair wigs to vinyl doll heads. It also adheres well to slush-molded vinyl objects.

American Wheelabrator & Equipment Corp., 837 S. Byrkit St., Mishawaka, Ind., announces the following promotions: **Robert L. Orth**, formerly district manager of the Detroit sales office for 14 years, is now field sales manager for the company's home office; **Julius E. Skene** has been promoted to manager of customer service; and **Philip R. Jordan** has been made chief sales engineer.

Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y., announces the appointment of **Harry B. McClure** as executive vice president of Carbide and Carbon Chemicals Co. and **Carl A. Setterstrom** as general manager of the Textile Fibers Div. of Carbide and Carbon. Mr. McClure joined the organization in 1928 and for the past 20 years has been concerned mainly with the development of new chemicals and finding new industrial uses for these materials. Mr. Setterstrom was formerly sales manager of Textile Fibers Div., whose principal product is Dynel.

Olin Industries, Inc., New Haven, Conn., has purchased control of Interstate Natural Gas Co., Monroe, La., from Standard Oil Co. of New Jersey. Mr. Olin, president, stated that Interstate was acquired to provide his company with a facility to aggressively explore and develop the mineral rights of its 455,000 acres of land in east Texas, Arkansas, and Louisiana, acquired from Frost.

Interstate produces and transports natural gas from the Monroe gas fields to refineries in Baton Rouge over its 870 miles of pipe lines. The company owns substantial gas reserves in the Monroe field and controls larger reserves through contracts with various producers.

Interchemical Corp., 67 W. 44th St., New York 36, N. Y., has established a commercial research department which will consolidate activities formerly carried on by various departments of the company. **Dr. Zeno Wicks** is manager of the new department and will report to **Norman Cassel**, vice president concerned with research and development. His associates are **Henry Young** and **John Duane**, with **Milton Zucker** serving as active consultant.

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., announces the following appointments, effective Sept. 1: **Lincoln B. Crosby** has been named manager of the division, succeeding **Robert M. Morris**, who was recently appointed production manager of the Organic Chemical Div., St. Louis, Mo. **Allen G. Erdman** will succeed Mr. Crosby as general manufacturing superintendent of the plant's Saflex, Vuepak, and Sheet Depts. Mr. Crosby joined the division in 1939 and has been a general manufacturing superintendent since 1948. He previously served as plant manager of **Shawinigan Resins Corp.**, a Monsanto associated company. The Plastics Div. also announces that **John** and **Earline Brice** are now style and design consultants to fabricators of Ultron vinyl film.

Monsanto's Organic Chemicals Div., St. Louis, Mo., has appointed **James H. Lum**, formerly manager of the Phosphate Div., as director of development. He succeeds **Alfred T. Loeffler**, who has joined the Chemicals Div. of Food Machinery & Chemicals Corp. Mr. Lum joined Monsanto in 1936 when the company acquired Thomas & Hochwalt Laboratories, Dayton, Ohio, and was named assistant research director in 1945. The following year he became executive director of the Clinton National Laboratories, Oak Ridge, Tenn., an atomic energy installation then operated by Monsanto.

Linzmeyer Development Laboratories, Inc., 18 Chasner St., Hempstead, N. Y., has been established for product development analysis of reinforced plastics items, with emphasis on structural work, and custom molding of reinforced plastics items. **Louis G. Linzmeyer**, formerly chief engineer of the plastics division of East Coast Aeronautics, heads the company.

PERSONAL

Edison H. Shaw has been appointed manager of the new district office of **Pittsburgh Coke & Chemical Co's Plasticizer Div.**, 420 Bulkley Bldg., Cleveland 15, Ohio.

Gerald Reinsmith has been named manager of the **Narmco Industries'** office of **Narmco Inc.**, 734 15th St., N. W., Washington 5, D. C.

John R. Lyons is now technical representative of **Sindar Corp.**, 330 W. 42nd St., New York 36, N. Y.

George M. Prall has joined **Western Textile Products Co.**, 2131 Hickory St., St. Louis, Mo., to set up and manage the company's extrusion operations. Mr. Prall was formerly assistant manager of Clopay Corp.'s Extrusion Div.

John T. Galvin has been appointed sales manager of the **Plastics Div., Fabricon Products, Inc.**, 1721 W. Pleasant Ave., River Rouge 18, Mich. Mr. Galvin was formerly in charge of the company's New York sales office serving the East Coast.

Donald Dailey, vice president of **Servel, Inc.**, Evansville, Ind., has received the Industrial Designers Institute award and medal for his design of Servel's refrigerette, Wonderbar, and the pioneer use of plastics in the refrigeration field. The medal was presented to Mr. Dailey at the third national design award ceremonies held at the Ambassador East Hotel, Chicago, Ill.

L. A. Walters has joined **Rex Corp.**, West Acton, Mass., as director of research. In recent years Mr. Walters has been engaged in independent research and development work on resin emulsion. Prior to that, he was on the research staff of Union Carbide and Carbon Corp. and Bakelite Co.

Henry S. Curtis has been promoted to the post of manager of production and engineering of **Diamond Alkali Organic Chemicals Div., Inc.** and will make his head-

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Our 150,000 square feet of floor space devoted exclusively to the processing of plastics materials, together with our complete laboratory facilities for testing, analyzing and pilot running enable us to offer the world's finest facilities for salvaging plastics scrap and by-products of the plastics industry.

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quarters at the division's plant at Houston, Texas. He succeeds Charles H. Kolker, who had resigned. Mr. Curtis was formerly associated with Glenn L. Martin Co., Painesville, Ohio, and Westvaco Chemical Div., Food Machinery & Chemical Corp., S. Charleston, W. Va.

Maxwell I. Schultz has been elected president of **Technical Tape Corp.**, W. 177th St. and Harlem River, Morris Heights 53, N. Y.

John V. Alcorn has been appointed business manager of **Gladwin Plastic, Inc.**, 275 Houston St., N. E., Atlanta, Ga.

Ralph K. Gottshall has been elected president of **Atlas Powder Co.**, Wilmington 99, Del. Mr. Gottshall has served as executive vice president of the company since May 1952 and has been a director and member of the executive committee since 1951. Prior to that time, he was assistant general manager of the explosives department.

Morell Marean is now sales manager of **American Polymer Corp.**, 101 Foster St., Peabody, Mass.

Richard E. Hartung has joined **Autograf Brush & Plastics Co., Inc., Div. of Johnson & Johnson**, 500 Fifth Ave., New York 36, N. Y., as manager of Industrial Sales.

John W. Shannon is now associated with **Whitso, Inc.**, 9330 Byron St., Schiller Park, Ill., as sales manager. He will handle sales for Whitso, Inc. and Marion Molding Corp.,

H. D. Allick has been assigned to the New England staff of **The Goodyear Tire & Rubber Co.'s Chemical Div.**, with headquarters in Boston, Mass. Mr. Allick will service customers using Pliovic vinyl resin and assist them in the use of Goodyear's new polyvinyl chloride series of resins.

Glen Mellen has been named chief development engineer of **High Vacuum Equipment Corp.**, 349 Lincoln St., Hingham, Mass.

John B. Gregory has joined **Frederick S. Bacon Laboratories**, 192 Pleasant St., Watertown, Mass., as a partner of the organization. Mr. Gregory is currently director of the Elastomers and Plastics Group of the Northeastern Section of the American Chemical Society and chairman of the Varnish Committee of the New England Paint and Varnish Production Club.

John R. Hoover, president of **B. F. Goodrich Chemical Co., Div. of The B. F. Goodrich Co.**, Rose Bldg., Cleveland, Ohio, has been elected a director of the Manufacturing Chemists' Association, 330 W. 42nd St., New York 18, N. Y. Mr. Hoover succeeds William S. Richardson, now executive vice president of B. F. Goodrich, on the association's board for a three-year term.

Charles L. Walters, sales manager for **St. Regis'** decorative laminate, Panelyte, in the United States and Canada, has been elected vice president of **St. Regis Sales Corp.**, 230 Park Ave., New York 17, N. Y., sales subsidiary of St. Regis Paper Co.

Harold J. Carr is now director of business research of **Owens-Illinois Glass Co.**, Toledo, Ohio. Mr. Carr joined the company in 1942 and the following year was named general manager of the Closure and Plastics Div. He has been a vice president of the company since 1947.

Milton E. McCrosson, formerly president and manager of Rocky Mount Rayon Mills, has joined **Cheney Bros.**, 350 Fifth Ave., New York 1, N. Y., as industrial fabrics sales manager. He will supervise sales of all industrial and glass fabrics.

Abner C. Hopkins, Jr. has been appointed director of Chemical Sales, Chemical Div., **General Mills, Inc.**, 400 Second Ave., S., Minneapolis 1, Minn. He was formerly director of Commercial Chemical Development at the company's research laboratories. Mr. Hopkins will remain temporarily at the general offices in Minneapolis before establishing an office at the company's plant in Kankakee, Ill.

E. Davis Caldwell has been appointed as a special representative on plastics to the automotive industry in Detroit by **Plaskon Div., Libbey-Owens-Ford Glass Co.** With offices in the Fisher Bldg., Detroit, Mich., Mr. Caldwell will be responsible for the use by auto manufacturers of Plaskon's alkyd molding compounds in electrical and mechanical parts, fibrous glass reinforced plastics in auto bodies, and urea and melamine molding compounds in molded color accessory units.

Deceased

Ralph Curtis Bedell, vice president and director of **Michigan Molded Plastics, Inc.**, Dexter, Mich., died on June 26. Mr. Bedell had been associated with the organization since 1933.

Harold G. Valentine, vice president of **Norton Laboratories**, 520 Mill St., Lockport, N. Y.

Leo M. Trilling, vice president of **The Bolta Co.**, Lawrence, Mass.

MEETINGS

Aug. 27 — Society of the Plastics Industry, Leominster - Worcester Chapter Annual Golf Outing and Dinner, Wachusett Country Club. W. Boylston, Mass.

Sept. 6-11—American Chemical Society, 124th National Meeting, Hotel Conrad Hilton, Chicago, Ill.

Oct. 8-9 — Society of the Plastics Industry, New England Section Meeting, Equinox House, Manchester, Vt.

Oct. 27 — Association of Consulting Chemists and Chemical Engineers, Inc., Annual Meeting and 25th Anniversary, Hotel Belmont Plaza, New York, N. Y.

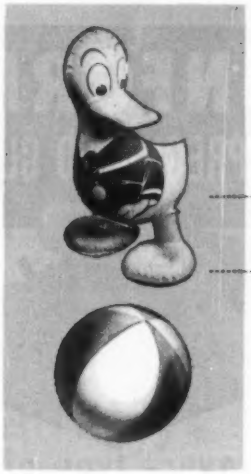
Nov. 30-Dec. 5 — Chemical Industries Exposition, Commercial Museum and Convention Hall, Philadelphia, Pa.

Dec. 3-4 — Society of the Plastics Industry, Fifth Film, Sheeting, and Coated Fabrics Division Conference, Commodore Hotel, New York, N. Y.

Dec. 13-16 — American Institute of Chemical Engineers, Annual Meeting, Hotel Jefferson, St. Louis, Mo.

S. P. E. Meeting

Sept. 9—M. W. Birney, Consolidated Molded Products, will address the Newark Section on "Quality Control in Plastics."



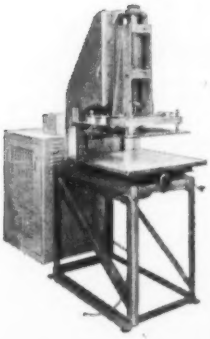
AN ARGUMENT FOR WELDING VINYL THAT HOLDS WATER

THERMATRON Electronic welding equiment is leading a technological revolution that sweeps the field of plastic fabrication. The case for THERMATRON is air-tight and water-tight; holds water in—and keeps water out. The old-fashioned method of sewing plastics is proved full of holes—perforations that rob the material of its strength.

THERMATRON welds, doesn't stitch, plastics. Does the job in seconds instead of long minutes. Drops costs and permits volume production—and the finished product looks better, wears longer, SELLS better.

THERMATRON

If *you* fabricate vinyl plastics THERMATRON engineers can certainly help you. Without obligation we'll gladly run tests on your own materials and offer sound recommendations. Please write us, and request your copy of Bulletin No. 76



Standard Thermatron models from ¼ KW to 6KW weld vinyl from .002" up to .080", serving most requirements . . . but if you have a new and special need we can build to your specifications.

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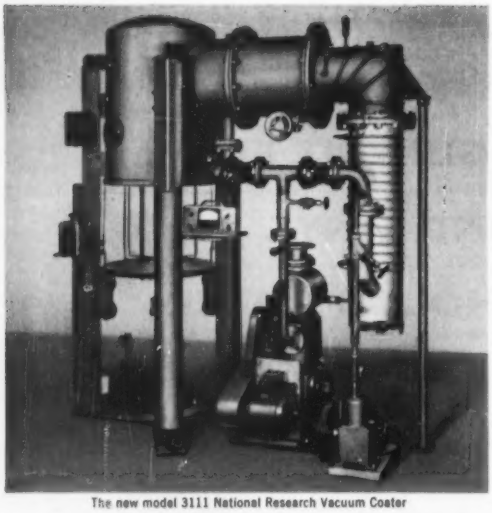

The new model 3111 National Research Vacuum Coater

VACUUM COATER

$6350* COMPLETE — READY TO OPERATE

for medium production

If your vacuum metallizing production has outgrown the bell-jar stage, here's your answer. A new, low cost coating unit complete with Alphatron® gauging, jigs with manual rotator and filament power supply. It swiftly coats plastics or metal surfaces with a gleaming layer of metal.

Simple to operate. All loading, unloading and operating is done at a single station. Equipped with NRC Rotary Gas Ballast Pumps that maintain initial cfm rate even when pumping water vapor, plus a 10-inch diffusion pump. Pump down time to coating pressure is approximately 4 to 5 minutes with the tank dry and empty. Tank size 24 inches in diameter, 30 inches high. Write for details.

*F. O.B. Newton, Mass.

Loading and unloading the racks

Operating the coater

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CHEMISTRY, METALLURGY
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PROCESS DEVELOPMENT
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PRE-IMPREGNATED GLASS

It's NEW... It's TOPS

for every type of

LOW PRESSURE LAMINATING

SUNFORM is glass cloth impregnated with polyester resin plus catalyst ready for immediate forming. It unrolls like a roll of paper.

Check these outstanding features

- ✓ CONTROLLED RESIN CONTENT
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- ✓ SHORT CURE CYCLE
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SUNFORM is the answer to your "low pressure" problem. Write now for fact-filled folder!

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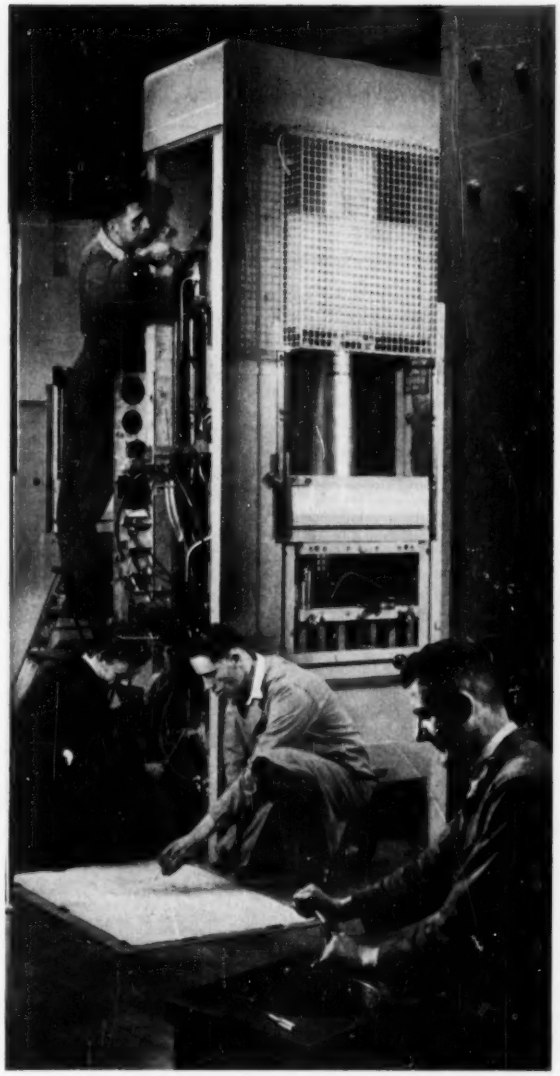
This press sets new standards for efficiency and economy



THE PRESS the men are building is a Bipel downstroking prefiller press. This particular type of press has made a mark for fine compression and transfer molding wherever it has been installed.

What you cannot see in the picture, of course, is the *great* difference between this compact Bipel and a conventional four-column press. Here is a *complete* molding machine, compactly built, better designed and engineered in every detail, and much more flexible in use. Additionally, at just the push of a button, the Bipel's patented "auto control" will, once set, faithfully reproduce any molding cycle regardless of its complexity.

Perhaps an example or two of the Bipel's superiority would be in order. One user, on a 7" molding reports a tolerance of ±.003" with a Bipel, as contrasted with ±.014" on column type presses. Another user reports that his sixty ton Bipel will close, apply sixty tons clamping pressure, and start to transfer the material all within two-and-a-half seconds.

The performance of the Bipel press is closely dependent upon the advantages of the Bipel line feed system with a single central power unit. One such power unit, using trouble-free medium pressure which is stepped up to higher pressure *at the press*, can drive as many as twelve Bipel presses. A miniature of this unit can be built into the press frame for single press installations. The components, the pumps and the accumulators, are remarkably inexpensive to install and to maintain.

This unique line feed system plus in-the-press intensification provides a range of three working pressures (1:1, 2:1, 3:1) per press. Bipel Type 40 operates at 20, 40 or 60 tons; Type 100, at 50, 100 or 150 tons; Type 200, at 100, 200 or 300 tons.

We are certain that additional details will further prove the worth of Bipel presses and power drives. Your request will be answered promptly.

B·I·P GROUP

B.I.P. ENGINEERING LTD.

Aldridge Road, Streetly, Staffs, England

CLASSIFIED ADVERTISEMENTS

MODERN PLASTICS reserves the right to accept, reject or censor classified copy.

EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

FOR SALE: Quick delivery Rubber and Plastic Equipment. Farrell 16" x 48", and 15" x 36", 2 roll rubber mills. Other sizes up to 64". New Seco 6" x 12" and 6" x 16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. Stokes #280, 4" dia. Preform Machine. W.S. 300 ton downstroke Hydr. Press, 20" x 20" Platens self contained. 350 ton 22" x 24". New Loomis 340 ton & 50 ton Hydr. Presses. 24" x 56" Platens. 200 ton Brunswick 21" x 21" Platens, 14" Ram. Record Presses. W.S. 150 ton 30" x 60". 100 ton 24" x 24". Elms 75 ton 30" x 36". Also presses Lab. to 2000 tons from 12" x 12" to 48" x 48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump. 250# W.P. W.S. 4 Plgr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2000 lbs. Elmes Hor. 4 Plgr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machines ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street. Brooklyn 15, N.Y. STerling 8-1944.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: HYDRAULIC PRESSES: 42" x37" 20" ram, 475 tons; 2-7 opening 27"x27", 18" ram, 565 tons; 24"x24" 12" ram, 170 tons; 24"x20" 10" ram, 118 tons; 20"x20" 10" ram, 118 tons; 20"x20" 10" ram, 200 tons; 30"x30" 8" ram, 75 tons; 24"x20" 8" ram, 75 tons; 14"x14" 8" rams, 75 tons; 15"x15" 8" ram, 75 tons; 2-18"x24" 10" rams, 78 tons; 12"x12" 6½" ram, 50 tons; 14"x14" 8" ram, 50 tons; 8"x9½" 4½" rams, 20 tons; 16"x16" 3½" rams, 12 tons; PREFORM PRESS: Colton 5½-T, Reeves Drive and Motor; LABORATORY PRESSES: Carver & Watson Stillman Units; NEW UNIVERSAL DUAL PUMPING UNITS: 3-15 HP; NEW LABORATORY MILLS, and CALENDERS; EXTRUDER: Modern Plastic 1½"; ACCUMULATOR: HPM 6" ram 2500#, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York, 13, N. Y.

FOR SALE: 1—6"x12" Lab. Roller Mill; 1—Baker Perkins Banbury type 10 gal. Mixer, with pressure cover, m.d.; 4 Boiling 18"x18" 5-opening Hydraulic Presses; 1—HPM 4-oz. Injection Molding Machine; 2—Ball & Jewell Rotary Cutters; 1—100 gal. Patterson Kneadermaster S/S Mixer; 1—Eureka Rotary Cutter; 1—500 gal. Patterson Reaction jack. agit. Resin Kettles; 7—Dry Mixing Blenders, up to 11,000#; 1—NRM 1" electric heated Plastic Extruder; 2—Day Roball 82 Siftern, 40"x120" screens; 2—Rotex #12, 20"x37" screens; 1—Rotex 30"x48" Sifter; 3—Mikro Pulverizers 2TH, 3TH, 2DH. Also Grinders, Extruders, Compression and Injection Molding Presses, etc. Send us your Inquiries. Advise us what you have for sale. CONSOLIDATED PRODUCTS CO. INC., 13-14 Park Row, New York 38, N.Y. BArclay 7-0600.

FOR SALE: One Polyethylene Flat Sheet Take-Off Unit. Completely automatic roll change rewind with electronic tension control. End Trim Slitters with trim disposal unit. Stainless steel water bath unit. Both 60 inches wide. Manufactured by Progressive Machine Company. Used for test runs only. Original cost $10,000. Best offer will be accepted. Reply Box 822, Modern Plastics.

FOR SALE AT GREAT SAVINGS
Colton 2 and 3 RP Rotary & 4T Tablet Machines. Day 40 x 120 Single Deck Sifter. Great Western—all models. Mikro Bantam, 18H, 2TH, 3W, 3TH, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D.A. Unidor Jacketed Mixer. J. H. Day, from 8 up to 75 gal., Imperial and Cincinnatus D. A. Jacketed, Sigma Blade Mixers. Day & Robison Dry Powder Mixers, 100 up to 10,000 lbs. Package Machy. FA, FA4, Miller, Hayssen 3-7, Scandia auto. Wrappers. Hudson Sharp Campbell auto. Cellophane Wrapper.
REBUILT AND GUARANTEED
This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements.
UNION STANDARD EQUIPMENT CO.
318-322 Lafayette St.
New York 12, N. Y.

PARTIAL LIST of available machines, may be inspected in operation: 4 ounce New, our own machine. 60 ounce Jackson & Church, new 1950. 48 ounce DeMattia w/preplasticizer. 48 ounce Lester, almost new. 24 ounce Reed-Prentice 1949. 24 ounce Reed-Prentice 1950, $26,000. 22 ounce Impco vertical. 22 ounce Reed-Prentice, new 1948, $23,000. 16 ounce H.P.M., 1947, $16,500. 12 ounce Lester, $10,000. 12 ounce Fellows-Leominster, new 1950, $17,500. 12 ounce H.P.M., now 1941, $8,500. 12 ounce Lester, Model 2½-L, $12,500. 9 ounce H.P.M., new 1949. 8 ounce H.P.M., new 1941, $7,000. 8 ounce Lester, Model 2½-L, new 1949, $12,500. 8 ounce Watson-Stillman, 1944, $7,000. 8 ounce Reed-Prentice, 1941, $6,500. 4 ounce Reed-Prentice, 1941. 4 ounce Lewis, 6 mos. old, $6,500. 3 ounce Fellows, 2 years old. 2 ounce Watson-Stillman vertical. 2 ounce Fellows. 3—50 ton hydraulic presses used for making records. Vacuum Plating machine 4' rotary. We also have available several compression, transfer and preform presses. ACME MACHINERY & MFG. CO., P.O. Box 731, 102 Grove St., Worcester, Mass.

FOR SALE: 28 Ton Watson Stillman 18" x 18" Platen. 50 Ton Press 20" x 20" Platen. 75 Ton Adamson Press 20" x 20" Platen. 140 Ton Watson Stillman 23" x 17" Platen. 150 Ton H.P.M. 36" x 36" Platen. 250 Ton Watson Stillman 28" x 24" Platen. 300 Ton Watson Stillman 20" x 20" Platen. 300 Ton Watson Stillman 24" x 29" 20 Platen St. 800 Ton Watson Stillman Hobbing Press. 8 oz. WS, 9 oz. HPM, 4 oz. De Mattia Injection Molders. Accumulators, Lab. Presses, Pistons, Oil Pumps, Grinders, Pulverizers, Scrap Cutters. AARON MACHINERY CO., Inc., 45 Crosby St. New York 12, N.Y. WOrth 4-8233.

FOR SALE: Reinforced Plastics Presses 54" x 144", 30" x 60".—Injection Presses Reed 24 oz. (1948), 4 & 9 oz. HPM,8 & 16 oz. Lesters, 6 oz. Watson, 16 oz. Impco VF822, 1 & 2 oz. Van Dorn, 4 oz. Makray.—Extruders: 1½" NRM, 1—¼" MPM w. crosshead, 1—Royle Oil-heater, Conveyor 22' x 12".—Scrap grinders. Ovens. Transfer & Compr. Presses. Stokes Model 235A.—Preform presses: Colton 4½, Stokes 280C. Kux No. 25.—42" Slitting & Rewind. machine. 2 HP Gasboilers. List your equipment with me for prompt action. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

STOKES ROTARY Pellet Presses—RD-3 and RDS-3; Kux model 25; Ball & Jewell Stainless Steel Rotary Cutter #1½; Mikro Pulverizers #1-SH, #1-SI, #2-TH, #2-SI, #2-DH. Large stock steel and stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

WE HANDLE HYDRAULIC PRESSES, pumps and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 356-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

FOR SALE: 1 Foremost Grinder for plastics with a 25 H.P. motor. Will shred or grind any type of poly or plastic or vinyl scrap.—1 Jeffrey Swing Hammer Shredder with a 30 H.P. motor and controls. Used to pulverize any material. In excellent condition. ROART CO., 830 Monroe St., Hoboken, N. J.

INJECTION MOLDING MACHINE FOR SALE —Complete 4-ounce Watson-Stillman molding machine for sale at reasonable price. Time payments arranged. Location Southern Connecticut. Reply Box 807, Modern Plastics.

FOR SALE: Stokes Thermo-Setting Plastic press, Model 200D3, fifteen ton. Brand new. Liberal discount from list price. CHICAGO LATEX PRODUCTS, 5943 Grand Ave., Chicago, Ill.

PRE-PLASTICIZING injection molding presses. Two 12-ounce Crowns, purchased new February, 1953. Can be seen in operation. Reply Box 896, Modern Plastics.

NEW ACME 4 ounce injection molding machine. For information, ACME MACHINERY & MFG. CO., 102 Grove Street, Worcester, Mass. Telephone 7-7747.

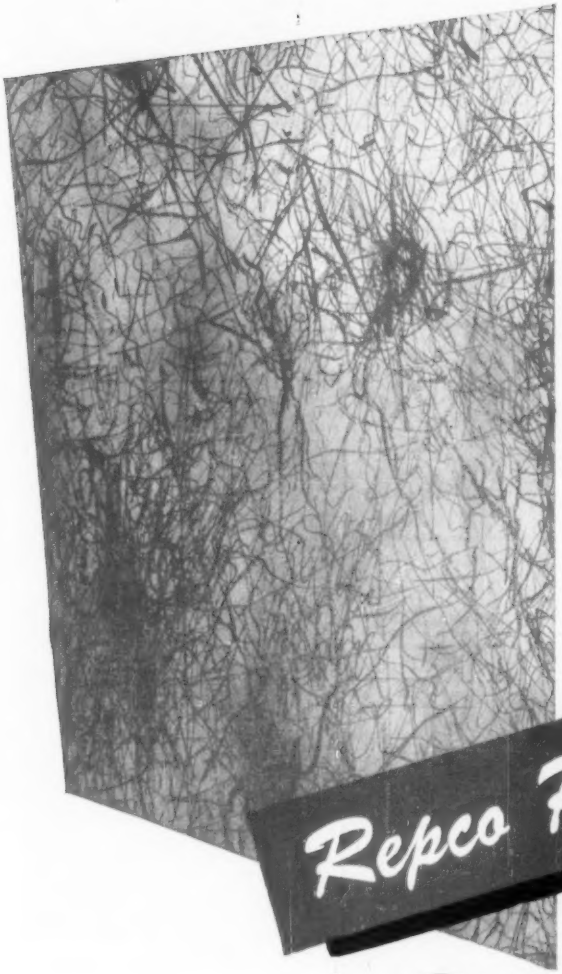
OFFER One Modern 18"x42" Farrel Plastic Mill, Complete. Reply Box 821, Modern Plastics.

MACHINERY and EQUIPMENT WANTED

WANTED
PLASTICS ROLLING MILL
48", 50", or 60". Right angle drive preferred, but not essential. Write full information on anything you have for sale. Reply Box 831, Modern Plastics.

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., 13-14 Park Row, New York 38, N. Y. BArclay 7-0600.

(*Continued on page 222*)



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SANDWICH CONSTRUCTION

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by Russell REINFORCED PLASTICS CORP.

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Lindenhurst 5-1700

Need we say more?

CLASSIFIED ADVERTISING

(Continued from page 220)

WANTED: Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider an operating or shut down plant. P. O. Box 1351, Church Street, New York 8, N. Y.

WANTED: Plastic injection moulding machines. Get our offer before you sell. ACME MACHINERY & MFG. CO., 102 Grove St., Worcester, Mass.

WANTED—Stokes semi-automatic molding press, 100, 125 or 150 ton capacity. Must be in perfect operating condition. State price and year. MORSKIL CO., 415 Lexington Ave., New York, N. Y.

MATERIALS FOR SALE

MANUFACTURER HAS A SURPLUS of 20,000 lbs. of Monsanto L4602 Metallic Bronze polystyrene. Call or write M. DWORKIN, 5252 S. Kolmar, Chicago 32, Ill., Phone RE 5-5252.

SCRAP P.V.C. and other thermoplastics in all forms. MICHAEL S. STEVENS, MERCHANTS Keswick Works, Keswick Road, London, S.W. 15, England.

MATERIALS WANTED

WANTED: PLASTIC SCRAP OR REJECTS in any form. Also surplus and obsolete lots of virgin molding powders. We also custom reprocess your own scrap. A. BAMBERGER CORP., 703 Bedford Ave., Brooklyn 6, N. Y. Telephone: MAin 5-7450.

WANTED: POLYETHYLENE VIRGIN AND REPROCESSED. Top prices paid, cash immediately, strictly confidential. Only original sealed bags of virgin acceptable. Only Grade A-1 of reprocessed acceptable. Make your surplus and obsolete inventories pay large profits! Your confidence is our trust. Best references. Wire-Write-Telephone: TRUWILL COMPANY, 15 Park Row, N. Y., Tel: REctor 2-7860.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 2004 McDonald Avenue, Brooklyn, N. Y., EE 5-7943.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic, Ethyl Cellulose. Reply Box 820, Modern Plastics.

PLASTIC CHECKERS, diameter 1⅛-1¼ in., thickness ¼-5/16 in. in bright red, yellow, blue and green. We have patent pending rights on a new kind of game. Your offer may lead to large and continuous orders. Send samples and quotations to: QUI VIVE MFG. CO., 1249 N. Ashland Ave., Chicago 22, Ill.

WANTED: VINYL and POLYETHYLENE SCRAP in any form. Facilities available for milling, compounding, straining, coloring, pelletizing and extruding Vinyl and Polyethylene. We BUY, SELL and REPROCESS plastic waste. If you use reprocessed materials or have plastic reprocessed, our experience and know-how will add up to profits for you. INDUSTRIAL PLASTIC CO., P. O. Box 1188, Plainfield, N. J.

WANTED: SURPLUS UREA molding powder. Reply Box 819, Modern Plastics.

MOLDS FOR SALE

DIES & PATENT—Novel "flick open" two piece, end opening case, including low cost molded hinge. Presently detailed for spectacle case but suitable for "pop open" toy, pencil box, tooth paste and brush package, etc. Royalty or outright. CORKY SPECIALTY CO., Box 32, Pleasant Ridge, Cincinnati 13, Ohio.

FOR SALE: 1—4 cavity baby brush mould. 1—brush and mirror mould. 1—cover mould for miniature piano cigarette box. ROART CO., 830 Monroe St., Hoboken, N. J., HOboken 2-2020, 2021.

MOLDS WANTED

DO YOU HAVE ONE OR MORE BOX MOLDS? If you do, it will pay to get in touch with us. We are one of the most progressive sales organizations in the east specializing in selling rigid plastic boxes to manufacturers for packaging their products. Non-exclusive arrangement satisfactory. Commission basis. Write OPPENHEIM COMPANY, 55 West 42 Street, New York 36, New York.

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resaleable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to VICTORY MANUFACTURING COMPANY, 1722 W. Arcade Place, Chicago 12, Illinois.

INJECTION MOLDS for staple items wanted. Domestic molder wishes to purchase used Injection Molds for foreign affiliate. Send full particulars including price and samples with first letter. Spot cash available. Principals only. Reply Box 810, Modern Plastics.

MOLDER WANTS MOLDS for consumer items—any kind of item. Injection molds. Compression molds. Advise item, type of mold, number of cavities. Reply Box 803, Modern Plastics.

WE WOULD LIKE TO ARRANGE for Loan or Purchase one Infant's Trainer Seat Mould. Reply Box 818.

PLANT FOR SALE

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 814, Modern Plastics.

PLANTS WANTED

PLASTICS PLANTS WANTED. Going Business, Volume $300,000 to $3,000,000: Consumer-Proprietory or Industrial Products: We represent a Leading Nat'l. Corporation: Seeking Diversification & Expansion into new fields and Territories. Sizeable Investments Preferred: Name of Company on request: Competent and Confidential Dealings. GOLDEN INDUSTRIAL AGENCY, 2189 Gr. Concourse, N. Y. 53.

U. S. INJECTION MOLDER wants to buy injection molding plant in Puerto Rico. Large or small. Reply Box 802, Modern Plastics.

HELP WANTED

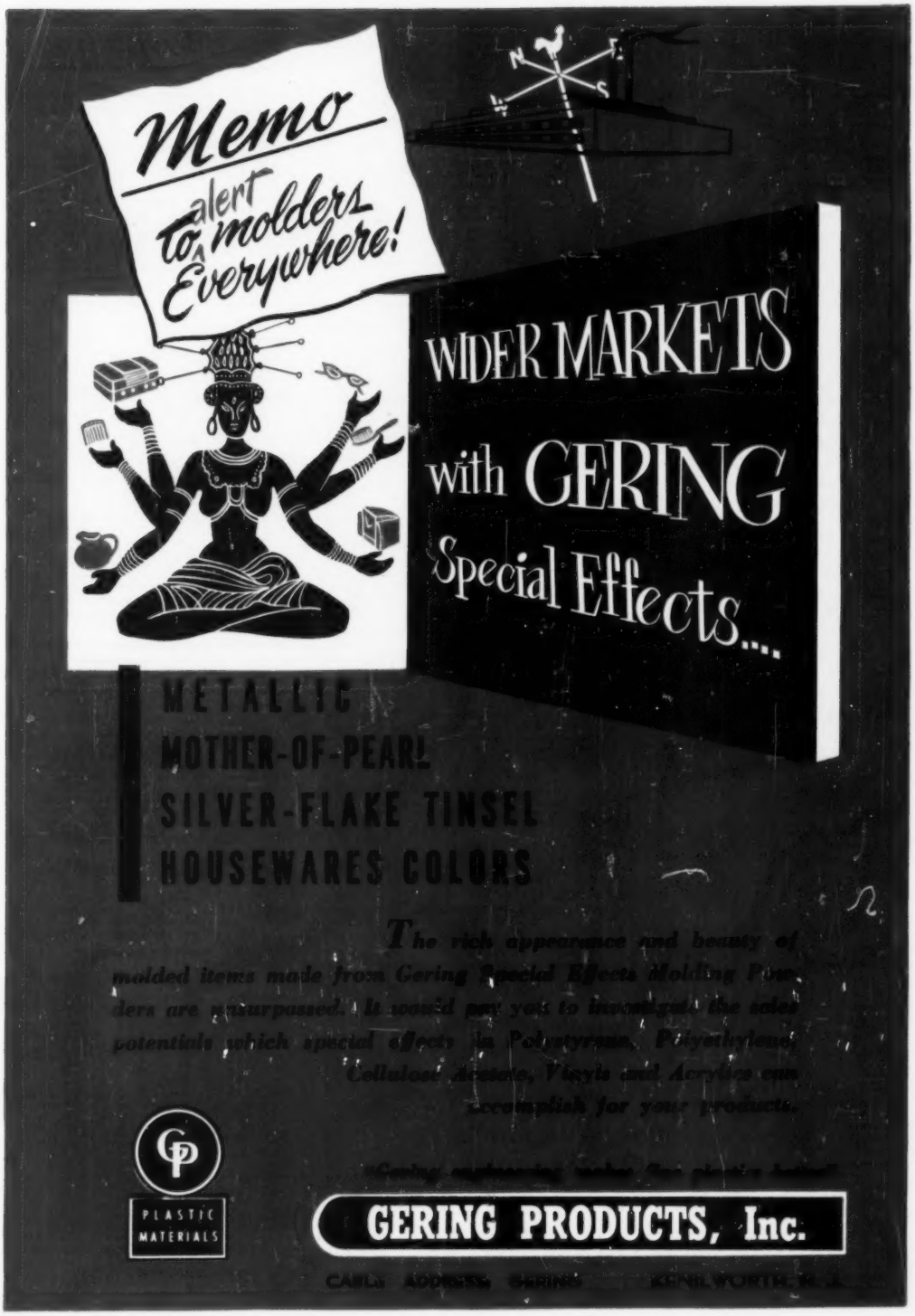
TWO MEN WANTED by large New York area processing plant.—VINYL CHEMIST experienced in the formulation and processing of injection and extrusion grade vinyl compounds. Knowledge of scrap reclamation desirable. FOREMAN. Extrusion compounding and coloring foreman required. Excellent opportunity for man experienced in coloring, blending and compounding thermoplastic materials. Must be capable of taking complete charge of night shift. Submit detailed resume of training, industrial experience, age and salary requirements. Reply Box 833, Modern Plastics.

SENIOR TOOL ENGINEER
Leading manufacturer of reinforced plastic laminates has an opening for a man with a knowledge of manufacturing techniques and who is familiar with tooling practices in the industry. His experience must include tooling for various types of construction, such as honeycomb sandwich, foam and preform.
His principal duties will be to investigate latest tooling methods employed in the reinforced plastics industry and develop better tooling practices. Considerable travel will be involved, visiting customers and tool suppliers.
This is a permanent position with an old established firm. It will pay a good starting salary to the right man and offer excellent opportunities for further advancement.
We can offer exceptional employee benefits—good living and working conditions—and challenging work.
Send resume to: Personnel Manager, THE BRUNSWICK-BALKE-COLLENDER COMPANY, Marion, Virginia.

SALES MANAGER with thorough knowledge of polyethylene pipe field. To establish a new department for Eastern extrusion company. Must be able to start department, recommend final products for manufacture, and arrange sales and distribution. Send complete resume and evaluation of volume capability. Reply Box 826, Modern Plastics.

EXTRUSION ENGINEER
Excellent opportunity for experienced man around 30 years old, as a project engineer in rapidly expanding extrusion company. Must be qualified to design and build tools and fixtures for fabrication of extruded sections, design and develop extrusion dies for all thermoplastics and be supervisory caliber who can eventually direct the entire activities of the engineering department. Midwest location. A complete experience resume will receive prompt and confidential consideration. Reply Box 829, Modern Plastics.

(Continued on page 224)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METALLIC
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SILVER-FLAKE TINSEL
HOUSEWARES COLORS
The rich appearance and beauty of molded items made from Gering Special Effects Molding Powders are unsurpassed. It would pay you to investigate the sales potentials which special effects in Polystyrene, Polyethylene, Cellulose Acetate, Vinyls and Acrylics can accomplish for your products.
PLASTIC MATERIALS
GERING PRODUCTS, Inc.

CLASSIFIED ADVERTISING

(*Continued from page 222*)

DRAFTSMAN AND TOOL DESIGNER familiar with design of compression and injection molds, required by one of the oldest and best established molders in the industry. Modern working conditions. When replying, give all qualifications. Reply Box 830, Modern Plastics.

PRODUCTION MANAGER—Growing Fiberglas Fishing Rod Plant has wonderful opportunity for man experienced in the manufacture of glass shafts. State experience and salary desired. All replies held in strictest confidence. Reply Box 801, Modern Plastics.

ENGINEER WITH EXPERIENCE in design of plastic products and is familiar with trade practices on tolerances; has knowledge of various plastic materials particularly as to their molding properties; experience with operation of molding equipment. Desired for research work in new molding techniques; developing experimental molds; conducting research into equipment, tools and methods; carrying out of experiments. Eastern location in desirable community within 75 miles of New York City. Reply Box 817, Modern Plastics.

TECHNICAL SALESMEN WANTED—Position open with large Midwest color manufacturer to head up color sales to the plastics and rubber industries. Must have some experience in the use of color in the plastics and rubber fields. Excellent opportunity for advancement in a new department. Reply Box 816, Modern Plastics.

EXTRUSION ENGINEER: Experienced extrusion man capable of handling projects through development, tooling and production of typical lighting fixture shapes, both large and small, and flat sheet in acrylic and high impact polystyrene. Knowledge of compounding, coloring and pelletizing may be required. Must be willing to locate in the Midwest. Write stating complete background, qualifications, salary expected, etc. All replies held in strict confidence. Reply Box 811, Modern Plastics.

FOREMAN (DAY SHIFT) INJECTION AND COMPRESSION. High calibre man needed by leading Southern California manufacturer. Complete knowledge of plastics required. Also require experienced draftsman for tool and die department. Send complete personal and business history including salary. All replies will be kept confidential. Reply Box 825, Modern Plastics.

POLYETHYLENE ENGINEER OR CHEMIST. Background in polyethylene film extrusion and embossing. Well financed company. Replies treated in confidence. Reply Box 815, Modern Plastics.

PHENOLIC RESIN DEVELOPMENT. Nationally known company has an excellent development opening for a chemist or chemical engineer with a heavy phenolic resin background. Location metropolitan New Jersey. Salary commensurate with experience. Reply Box 823, Modern Plastics.

FOREMAN. Large Brooklyn, N. Y. extrusion concern seeks foreman experienced in vinyl extrusion. Some knowledge of color matching desirable. Excellent opportunity for capable steady man. All replies will be kept confidential. Reply Box 809, Modern Plastics.

PLASTICS ENGINEER. Graduate engineer with 7-10 years experience in design and application of plastic molding machinery. This engineer should be fairly heavy with extrusion and thermoplastics experience and should be familiar with hydraulic and electrical circuits. Salary open. We are a sixty-year old progressive company and our "fringe" benefits are tops in the industry. Please send complete resume. Reply Box 824, Modern Plastics.

LARGE CUSTOM MOLDER requires the services of a man capable of managing Reinforced Plastics Division. Must be qualified to supervise Engineering, Estimating, Production and Development work. Thorough knowledge of polyester resins, molding techniques essential. Salary commensurate with background and experience. Send resume to AMERICAN INSULATOR CORPORATION, New Freedom, Pennsylvania.

TOP FLIGHT PLASTICS ENGINEERS with heavy experience in tool design and estimating required by progressive expanding Los Angeles molding plant engaged in all phases of the plastics industry including injection, compression and fiberglass. All replies will be held in confidence. Reply Box 834, Modern Plastics.

SITUATIONS WANTED

PLASTIC EXTRUSION PLANT MANAGER—Chemical Engineer, 34, offers 12 years of diversified experience in management, research, production, and plant operation including complete knowledge of vinyl compounding, die designing, vinyl and polythene extrusion, purchasing, personnel training, new product development, and equipment selection and installation. Desires important position with a good future in a solid company. Reply Box 828, Modern Plastics.

AVAILABLE—CONSULTANTS to the plastic industry. Men with proven records with leading companies throughout the country now offer their services. Whether it be Polyester synthesis, vinyl formulation or what have you, why maintain an expensive full-time technical staff, when our experts can solve your problems as they arise! Arrangements on a per diem or retainer basis. All inquiries held confidential. Reply Box 804, Modern Plastics.

PRODUCT DEVELOPMENT CHEMIST-TECHNOLOGIST wants permanent position. Practical consulting experience vinyls, polyethylene, polystyrene, celluloses; resins, sheets, packaging. Reply Box 805, Modern Plastics.

SALES AGENTS WANTED

SALES REPRESENTATIVES WANTED
Southern New England, Detroit, Chicago, Northern N. Y. State. Progressive established fabricator with complete facilities for thermoplastic vacuum forming and Fiberglas laminating is expanding its sales program.
Manufacturers Representatives in the above areas are to be appointed. Contracts protecting territories will be issued. Commission basis. Write explaining lines carried, background and references. DURABLE FORMED PRODUCTS, INC., 6 Greene Street, New York 13, N. Y.

WANTED
SALES AND PURCHASING
REPRESENTATION IN
MIDWEST AND SOUTHEAST By
LEADING CUSTOM COLORING HOUSE
IN NEW ENGLAND
For handling large and small lots of Thermoplastic materials only—Virgin, Reprocessed and Scrap. Attractive details will be arranged. Reply Box 808, Modern Plastics

SALES REPRESENTATIVE WANTED—LIQUID TYPE PHENOLIC AND UREA RESINS. (Solid Phenolics Also Available But Have Full Schedule) Will make commission or other suitable arrangement. Reply Box 832, Modern Plastics.

MISCELLANEOUS

SITUATIONS OPEN: Leading supplier of plastic materials seeks responsible distributors to establish strategically located fabrication shops on an exclusive basis. Licensees would be responsible for sale and fabrication of plastics for fume exhaust systems and acid resistant equipment. Please give full details. Reply Box 813 Modern Plastics.

FOR SALE: ACETATE, white, ivory, pink pastels, red, blue and green, at 28¢ per pound, F.O.B. New York, regular supply. Odd colors 23¢.
16 OUNCE IMPCO Injection Machine, without press, $5000.00.
THREE STEEL MOLDS for complete Baby Toilet Seat—$2500.00.
WANTED: a 350 ton Toggle Press.
PEERLESS CHEMICAL CORP.
181 Greene Street, N. Y. C. 12.

AUSTRIALIAN MANUFACTURER interested in contacting American Group specializing in production of polyester resins, view to cooperation and manufacture in Australia. Reply Box 812, Modern Plastics.

All classified advertisements payable in advance of publication
Closing date: 28th of the second preceding month, e.g., July 28th for September issue.

Up to 60 words $10.00	Up to 120 words $20.00	Up to 180 words $30.00
Up to 60 words (boxed) $20.00	Up to 120 words (boxed) $40.00	Up to 180 words (boxed) $60.00

For further information address Classified Advertising Department,
Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

TECHNICIAN OR CHEMIST —AMINO PLASTICS

Technician or Chemist required by reputable company in Northern Europe engaged in processing moulding powders. Qualifications should include industrial and chemical experience in manufacturing Urea and Melamine Powders. The position includes responsibility of the development of these products. Short time employment could also be considered.

Write Box 827, Modern Plastics, 575 Madison Avenue, New York 22, N.Y., stating qualifications and salary required.

Complete Line of

Machinery for Celluloid and Plastics Mfrs.

JOHN J. CAVAGNARO

HARRISON — ESTABLISHED 1881 Engineers and Machinists — NEW JERSEY

Mixers: Plain or Stainless
Preliminary or Vacuum

GLASS YARN SEALING CORD

Weatherproof-Extra Strong

Thanks to Chem-O-Sol (plastisol formulation)

Heavy glass yarn is coated with Chem-O-Sol (vinyl plastisol) to produce tough end sealing cord for tying conductors together in shipboard conduit cable. After heat is applied, the coating forms a weatherproof seal of tremendous strength. For this Navy application we supply Chem-O-Sols in 5 different colors — especially formulated for good low temperature flexibility and required flow properties.

Yarn is coated when drawn through Chem-O-Sol bath, and the coating is fused to toughness in a conventional tower — one more example of Chem-O-Sol versatility in solving production problems.

Other Uses of Chem-O-Sol

Material for Gear Shift Lever Cover

Dust-Proof, Damp-Proof Light Sockets

Photographs courtesy: Owens-Corning Fiberglas Corporation, Bakelite Company, Watts Electric and Manufacturing Company

WHAT CAN CHEM-O-SOL DO FOR YOU?

Chem-O-Sols are available in any color and for any type of application: Dipping, spreading, molding or casting. They contain no solvents, need only simple heating to be fused into tough coatings that resist oils and most chemicals.

Find out how you, like so many other manufacturers, can take full advantage of this unique material. Without obligation, we'll help you evaluate the usefulness of Chem-O-Sol for your product. Just tell us your requirements!

Formulators of lacquers, coatings, and finishes to improve your product

Chemical Products CORPORATION
102 KING PHILIP ROAD
EAST PROVIDENCE, RHODE ISLAND

INDEX OF ADVERTISERS

AUGUST 1953

best in the long run

or the short run . . .

Shaw Extruders give speedy and economical production of tubes, rods, belting, insulatings, sheathings, channels, sheets and coatings from all thermoplastic materials regardless of the length of run.

The Shaw 4½ Extruder. Design features include all electric heating, separately controlled barrel and die-head heater zones, die-tip heater and controller, water cooled feed hopper and screw, variable speed motor, screw speed indicator, push button control, V-rope drive for easy alteration of screw-speed range.

SHAW

PLASTIC EXTRUDERS

THERE IS A COMPLETE RANGE OF SHAW PLASTIC EXTRUDERS INCLUDING LABORATORY MODELS

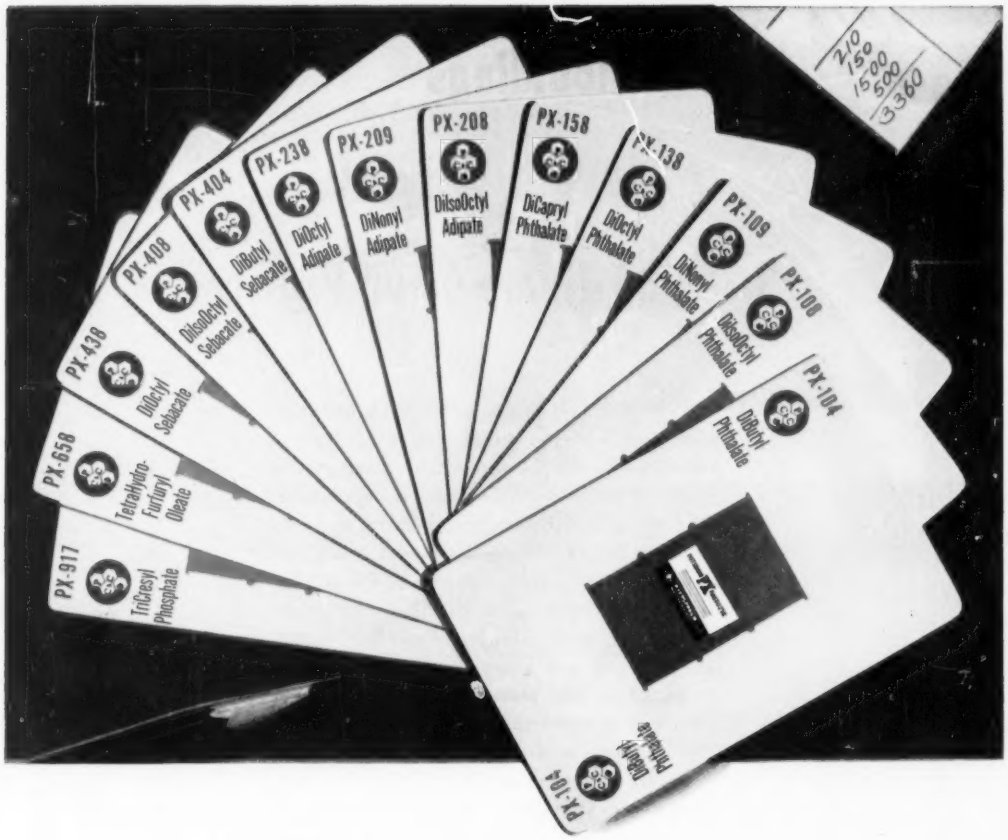
FRANCIS SHAW & COMPANY LIMITED MANCHESTER 11 ENGLAND

TELEPHONE: EAST 1415 8 TELEGRAMS: CALENDER, MANCHESTER

LONDON OFFICE: 34 VICTORIA STREET LONDON SW1 TELEPHONE: ABBEY 1800 TELEGRAMS: VIBRATE PHONE LONDON

MODERN PLASTICS

575 MADISON AVENUE • NEW YORK 22, N.Y.



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Whatever your plasticizer needs, you'll find Pittsburgh Coke & Chemical the *basic* source you can count on—for wide choice, for consistent peak performance and for prompt, continuing deliveries.

Whether you're buying Pittsburgh PX Plasticizers by the drum or by the carload, you'll benefit by our unique coal-to-finished plasticizer production control. With this assured quality as a starter, there's a good chance our engineers will be able to help you further increase your product quality and reduce production costs through better plasticizer selection and application. ● *Why not call or write us about it today?*

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Contains useful data on the plastics industry, the role of plasticizers in the industry, and descriptions and recommended applications of Pittsburgh PX Plasticizers. Write for your free copy today!

PLASTICIZER DIVISION

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Grant Building · Pittsburgh 19, Pa.

W&O 4552

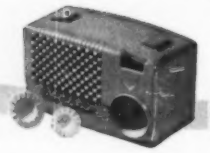
COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Plastic Mouldings

Have a Way of

Bringing Home Your Profits

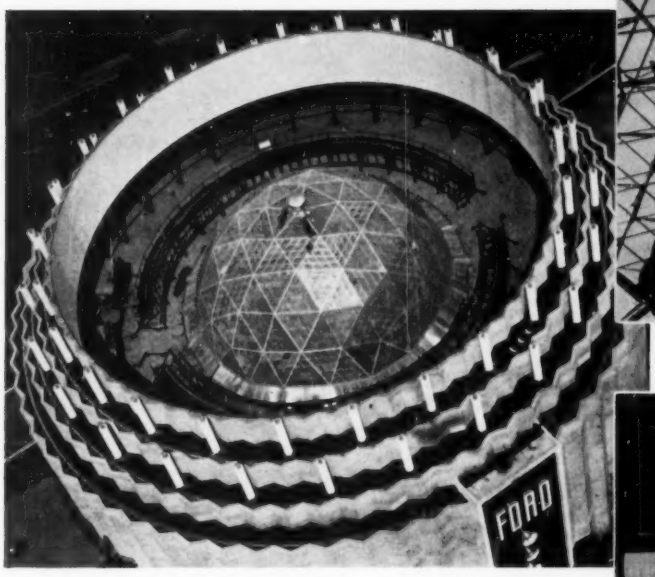
WMP's skill, equipment and experience as custom moulders is directed to a single goal: to make certain — *in advance* — that the plastics products and parts it moulds for manufacturers bring home steady profits to these manufacturers. Naturally, this requires thorough, careful study by WMP's engineers, die designers, and moulders — plus the specialized knowledge of production experts, finishers and inspectors. Thus WMP, serving as your own moulding department, literally moulds quality and selling appeal right into your product. Give your plastics product or part every advantage of WMP's abilities and moulding facilities. Write, phone — or better yet, let WMP fly you to Worcester for a personal visit.



Custom Injection Moulding

WORCESTER MOULDED PLASTICS CO.

14 HYGEIA STREET, WORCESTER 8, MASS.



Panes molded by
Molded Fiberglass Sheet Co.,
Ashtabula, Ohio.

FORD ROTUNDA HAS A NEW DOME OF BAKELITE POLYESTER-GLASS FIBER PLASTIC

TRADE-MARK

If this remarkable dome atop the Ford Rotunda in Dearborn, Michigan, were built of conventional materials, it would weigh *eighteen times* as much.

Instead, it's an aluminum framework covered with a shell of reinforced plastic—glass fiber mat bonded with BAKELITE Polyester Resins. The diamond-shaped panes of plastic are about 36 inches long, only 1/25 of an inch thick. They are molded in just three minutes at 215 deg. F. and 125 psi. Their edges are joined by riveting to two-inch strips of the same material, then sealed by BAKELITE C-8 epoxy resins.

The panes are assembled into triangular sheets measuring fifteen feet on a side. These are riveted to the outside of the triangular frames that form the aluminum supporting structure.

The dome stretches 93 feet across a central court, its rim resting on supports in the rotunda wall 60 feet above the ground. It rises another 46 feet to its center. Construction began at the 60-foot level around a central mast. As work progressed downward and outward, the dome was jacked higher. When the plastic skin was in place, and the rim rested on the supports, the mast and platform were removed.

Translucent, the dome casts a light blue color throughout the court below. It can be illuminated at night. Its strength is calculated to bear a snow load of 30 psi.

Simple, fast construction, light weight, strength, beauty, and durability all come with reinforced plastics made with BAKELITE Polyester Resins. They resist water, oil, chemicals, and heat, and have excellent electrical properties. Their growing list of uses may soon include your product. For information, write Dept. RH-13.

BAKELITE
TRADE-MARK
POLYESTER RESINS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
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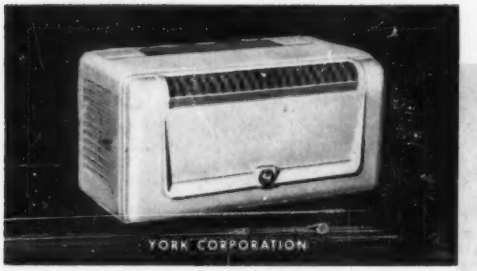
In Canada:
Bakelite Company (Canada) Ltd., Belleville, Ont.



WHY MAJOR
ROOM AIR-CONDITIONER
MAKERS

Come to G.E. for LARGE Plastics Parts

Room air-conditioner cabinets and cabinet panels molded by G.E. for five major producers

Plastics are today designed for mass-producing BIG items like room air-conditioner cabinets, television housings and refrigerator components . . . and General Electric's molding service is especially engineered to turn out large-size plastics parts quickly and economically.

That's why five major producers in the room air-conditioner industry alone come to G.E. for attractive, sturdy, lightweight plastics cabinets and panels.

For *your* next molding job, why not see G.E. *first?* G-E engineering know-how and tremendous press capacities offer you a cost-cutting combination that may mean important savings! Just write to General Electric Company, Section 340-7A, Chemical Division, Pittsfield, Massachusetts.

G.E.'s COMPLETE MOLDING SERVICE OFFERS YOU —

- Complete mold-making facilities
- Impartial material selection
- Injection presses from 3 to 208 ozs.
- Compression presses from 3 to 36 ins.
- Complete silicone rubber fabricating facilities
- Complete G-E mycalex molding facilities

PLUS the benefit of 61 years' experience in designing, engineering and molding plastics parts.

You can put your confidence in—

GENERAL ELECTRIC